JUN 27 1913

Engineering News

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Engineering News

CHARLES WHITING BAKER, *Editor*

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None sent free regularly, no returns from news companies, no back numbers

What The Buyer Needs To Know

Number Twenty-Six

At this writing the great Ninth Annual Convention of the Associated Advertising Clubs of America has been brought to a close at Baltimore. The work of the convention is summed up in the following declaration of principles:

We believe in truth, the cornerstone of all honorable and successful business, and we pledge ourselves each to one and one to all to make this the foundation of our dealings to the end that our mutual relations may become still more harmonious and efficient. We believe in truth not only in the printed word, but in every phase of business connected with the creation, publication, and dissemination of advertising.

We believe there should be no double standard of morality involving buyer and seller of advertising or advertising material. Governmental agencies insist on "full weight" packages and "full weight" circulation figures. They also should insist on "full weight" delivery in every commercial transaction involved in advertising. We believe that agents and advertisers should not issue copy containing manifestly exaggerated statements, slurs, or offensive matter of any kind, and that no such statements should be given publicity.

We believe that the present chaotic multiplicity of methods of arriving at verification of circulation statements are not only confusing but inadequate, and that the time for radical revision of these methods and for standardization of statements is the present, and the opportunity for constructive work along these lines is given by the assemblage at this convention for the first time of representatives of all the different interests concerned in this vital matter.

We believe in co-operation with other agencies now at work on this problem, especially in the plan of the Central Bureau of verification, which has already been initiated by some of the organizations represented in the convention, and request the Executive Committee to proceed therewith.

We indorse the work of the National Vigilance Committee, and believe in the continued and persistent education of the press and public regarding fraudulent advertising, and recommend that the commission, with the co-operation of the National Vigilance Committee, should pass upon problems raised and conduct campaigns of education on these lines. We believe it to be the duty of every advertising interest to submit problems regarding questionable advertising to this commission and to the National Vigilance Committee.

We believe that the elimination of sharp practice on the part of both buyer and seller of advertising and advertising material will result from the closer relationship that is being established, and that in place of minor antagonisms will come personal co-operation to the increased benefit of all concerned and the uplifting of the great and growing business of advertising.

We believe in upholding the hands worthy to be upheld, and we believe that each and every member owes a duty to this association of enforcing the code of morals based on truth in advertising and truth and integrity in all the functions pertaining thereto.

* * *

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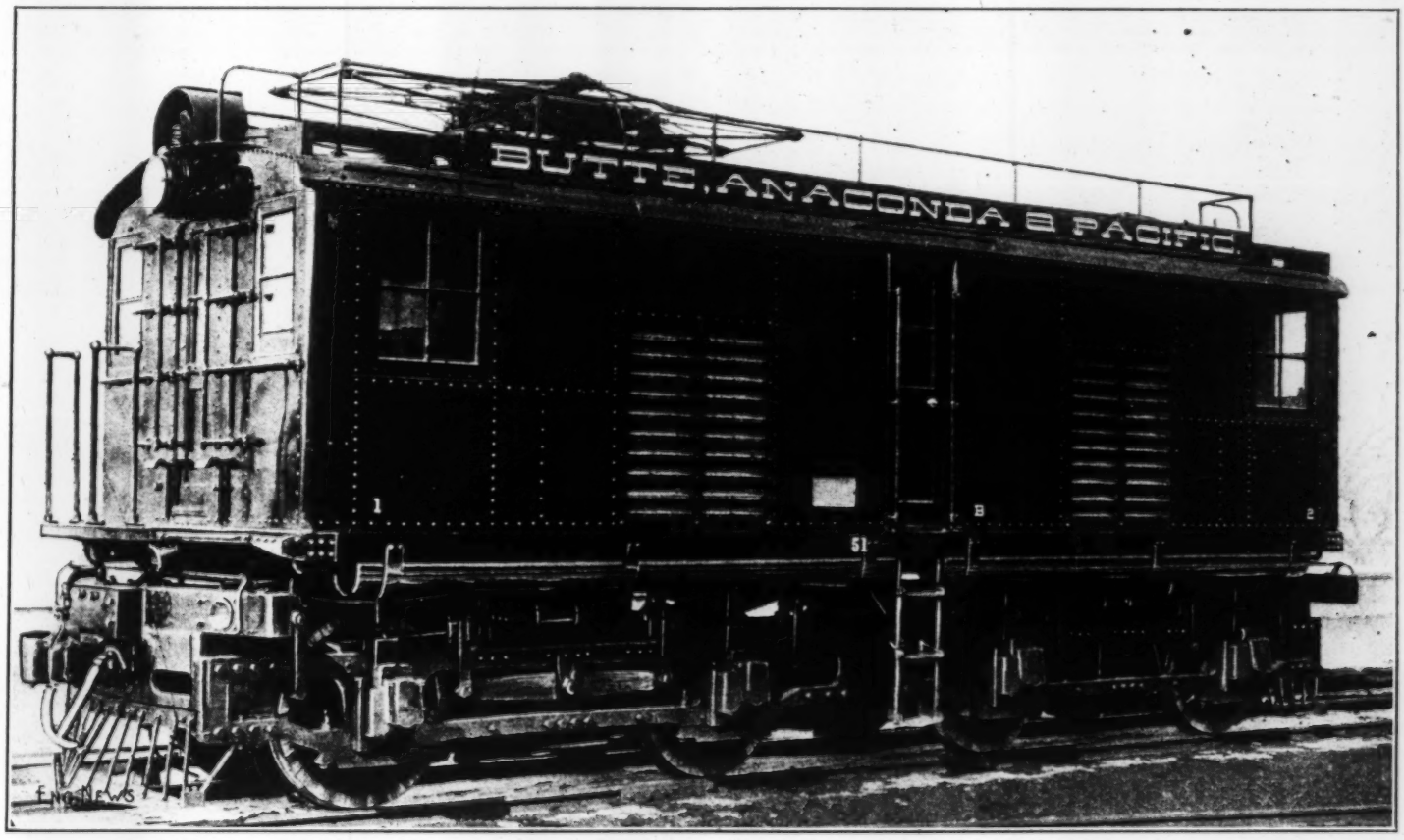
This association is representative of the reliable advertisers, writers and publishers of the country. They will live up to their creed.

Engineering News

VOLUME 69 JUNE 26, 1913 NUMBER 26

A 2400-Volt Direct-Current Locomotive; Butte, Anaconda & Pacific Railway

The proposed substitution of electric traction for steam on the Butte, Anaconda & Pacific Ry. was described in ENGINEERING NEWS, Aug. 15, 1912. It will be recalled that this is a standard-gage mining road, having a single-track main line about 30 miles long, besides some 84 miles of sidings, yards and smelter tracks.



2400-VOLT DIRECT-CURRENT FREIGHT LOCOMOTIVE; BUTTE, ANACONDA & PACIFIC RY.

The maximum grade against load is 0.3%, with 1% against the returning empties. The heaviest train has been 50 loaded ore cars (3400 tons).

Interest has centered largely in the proposal to use direct-current at 2400 volts, supplied to the locomotives from overhead catenary-supported trolley wires. The passenger cars are to be lighted from a 600-volt train line and heated from a 2400-volt line, jumper cables connecting cars and locomotives.

One of the locomotives for this road is shown in the accompanying figure. The initial equipment comprises 15 freight locomotives and two passenger units of nearly the same design. Single units, such as shown, will be used for making up trains and for car spotting. Freight trains will be hauled, however, by two coupled units. A passenger train will consist of one hauling unit and three coaches.

The locomotives are an articulated double-truck type (0:4:4:0) with all the weight on the drivers. A box cab, containing an engineman's compartment in each end and a central compartment for the control apparatus, etc., is carried on the truck frames by hollow center pins in the center transoms. It extends practically the entire length of the locomotive, being 36 ft. long, with its end platforms.

The trucks are built up of heavy steel castings. The side frames are a truss pattern with heavy top and bottom members and pedestal tie bars. They are connected by cast end frames and a cast center transom. The entire weight is carried on semielliptic springs with different equalization on each truck. As may be seen in the accompanying figure, the forward truck on each side has a single equalizer bar for the two side springs. On the rear truck only the two forward springs, on opposite sides of the truck, are equalized. Friction draft gear, mounted on the end frames, transmits hauling and buffing stresses to the truck frames and a knuckle joint transmits stress from one frame to the other, there being no buffing or hauling stresses carried by the cab.

There is one motor geared to each axle, with a solid pinion on each end of the armature shaft, meshing with gears on the wheel hubs. The reduction is 4.81 for freight units and 3.2 for passenger. Two units will haul a 5400-ton ore train at 15 mi. per hr. on the ruling grade, or at 21 mi. per hr. on level tangents. The maximum speed of a passenger train will be 45 mi. per hr. on level tangent track.

The motors are a commutating-pole (interpole) type, wound for 1200 volts and insulated for 2400. The motor casing is inclosed and provided with forced ventilation; air is supplied from a blower in the cab, being led along a duct sealed in the cab underframe, down the hollow center pins to the truck transoms and out to the motors.

The continuous capacity of each motor under forced ventilation is for 190 amp. on 1200 volts, and 225 amp. on 1200 volts for the one hour rating. For the double-unit 160-ton locomotive this is equivalent to a continuously sustained output of 2440 hp.; the one-hour equivalent is 2900 hp.

The cab underframe consists of two 12-in. longitudinal steel channels on either side of the center and two 6x6-in. steel angles along the outer edges. The central channels are inclosed and form a distributing air duct for forced ventilation.

The engineman's compartment, at either end of the cab, contains the seat, controller, air-brake valves, bell and whistle ropes, ammeter, air gages, sanders and other control apparatus that should be within immediate reach. These compartments are electrically heated.

In the central section is grouped the control apparatus. The contactors, reverser and rheostats are mounted in two banks running lengthwise of the compartment and are arranged with ample space between them to afford convenient access for cleaning, inspection and repair. All parts and circuits carrying 2400 volts are thoroughly protected from accidental contact. A dynamotor is employed to furnish 600 volts for the operation of contactors, lights and air compressor.

The control equipment on the locomotives is the well known multiple-unit type with which the main current is handled by special isolated switches (contactors) actuated by light currents from a master controller. There are the usual arrangements of series and series-parallel groups but no full parallel as the motors are a 1200-volt type. There are ten controller steps of the series grouping, with diminishing resistance, and nine in the series-parallel. Transition from series to series-parallel is secured without opening the motor circuits, and the acceleration can be kept smooth and close to the slipping point of the drivers. There are hand switches for cutting out either pair of motors, the locomotive then operating with one pair.

The contactors are similar to those employed in ordinary service, the variations providing for proper insulation at the higher voltage. There is a main hand switch, that can be opened under heavy currents, and three smaller 2400-volt switches, one for heaters and one for the dynamotor. In all these the switch blade is connected to a grounded-iron hand lever by a wood rod. There is also one main-circuit fuse and two motor-circuit fuses—all of a boxed copper-ribbon type placed as near as possible to the overhead collector. Auxiliary fuses protect the heater and dynamotor circuits. All have magnetic blowouts to insure proper rupture of the arc.

Current is collected by an overhead trolley on a pantograph frame. The pantograph is pneumatically operated and can be put into service from either end compartment by a hand valve. Each passenger locomotive has two collectors but each freight unit only one. A 2400-volt insulated bus line connected direct to the pantographs is run along the roof center of the cab. The bus lines are connected by couplers between the two units of the freight locomotive, so that current is obtained from both collectors or from a single collector. Collectors and bus lines are guarded by railings.

The locomotives are equipped with arc headlights. The cab illumination is provided by ten incandescent lamps arranged in two circuits, one lamp being placed in each end compartment and the rest in the center. A 600-volt bus line is provided on the passenger locomotives for lighting and a 2400-volt bus line for heating the passenger coaches.

The air brakes are the combined straight and automatic type. The motor-driven air compressor is a two-stage affair, with a piston displacement of 100 cu.ft. per minute, pumping against a tank pressure of 135 lb. per sq.in. Air is taken from the interior of the central compartment through a screen; in passing from the low- to the high-pressure cylinder the air is led through cooling pipes on the roof of the cab. This reduces the temperature and condenses the moisture burden before entering the high-pressure cylinder. From the latter it is delivered into four reservoirs, each 12x161 in., located under the floor of the cab and connected in series.

Pneumatic sanders are used and the valves are arranged for sanding the track in front of the leading wheels when running in either direction. The necessary bells are fitted with automatic ringers, and the whistles are air-operated. All wiring is drawn through conduit.

The principal data and dimensions applying to the locomotives are the following:

Length inside of knuckles	37 ft. 4 in.
Length over cab	31 ft.
Height over cab	12 ft. 10 in.
Height with trolley down	15 ft. 6 in.
Width over all	10 ft.
Total wheel base	26 ft.
Rigid wheel base	8 ft. 8 in.
Total weight	160,000 lb.
Weight per axle	40,000 lb.
Wheels, steel tired	46 in.
Journals	6x13 in
Gears, forged rims, freight locomotives	87 teeth
Gears, forged rims, passenger locomotives	80 teeth
Pinions, forged, freight locomotives	18 teeth
Pinions, forged, passenger locomotives	25 teeth
Tractive effort at 30% coefficient	48,000 lb.
Tractive effort at one hour rating	30,000 lb.
Tractive effort at continuous rating	25,000 lb.

An Act to Abate Smoke at Albany, N. Y., was passed by the Legislature of 1913. The act declares to be a nuisance any stack, chimney or furnace within the city of Albany, or within two miles from that city, not being used for a private dwelling, which sends forth smoke in such quantities and of such a density as to be capable of causing injury to the health of residents or to public or private property. Exemptions are made for brief periods while starting or cleaning fires. Smoke of greater density than is indicated by No. 3 on the Ringelman smoke chart issued by the U. S. Bureau of Mines, will be sufficient evidence of "density capable of causing injury to health or property of residents of the city, but proof of injury may be made by other means also. Violation of the act is declared to be a misdemeanor. The act is enforceable by the city of Albany, through its corporation council and is to take effect July 1, 1913. In approving the bill on May 31, 1913, Governor Sulzer attacked a memorandum to the effect that the mayor and council returned the bill to him without action on the ground of not having jurisdiction. He added that in his belief the "proper enforcement" of the act "will rid the city of Albany of an intolerable nuisance."

Steel Ties on Foreign Railways

The extensive use of steel ties in some countries of Europe and in other foreign countries has been advanced as an argument in favor of their more extensive use in this country. On the other hand, it has been stated that none of the foreign ties now in use are strong enough for track carrying the heavy trains and heavy driving-axle loads (50,000 to 60,000 lb.) of American trunk line railways. The steel ties now in use on foreign railways are almost exclusively of the inverted-trough type. They are manufactured extensively in England and Germany, for while none are used in England, they are exported in large quantities to India and the colonies. The ties are usually quite shallow, about 3½ in. deep, the Swiss tie described below being a typical example. The only steel tie used extensively in this country is of I-beam section (like the Severac tie used in Europe many years

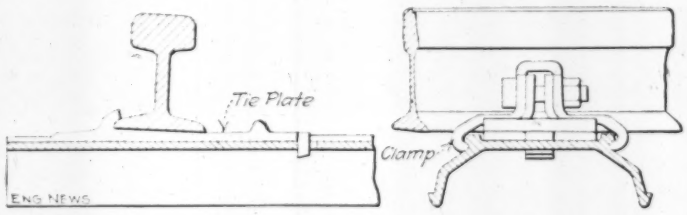


FIG. 1. STEEL TIE OF THE HAARMANN TYPE (1911 DESIGN); PRUSSIAN STATE RAILWAYS

ago); for heavy traffic lines it is usually 5½ in. deep, 4½ in. wide on top, 8 in. wide on the bottom, and weighing 170 to 180 lb. for a length of 8½ ft.

Attention may be called to the fact that in India cast-iron ties are used very extensively, and orders for such ties are placed frequently with English makers. Each tie consists of a pair of bowls or pots connected by a transverse tie bar (ENGINEERING NEWS, Aug. 17, 1911). While cast iron would not be considered a suitable material for track construction in this country, it must be remembered that for 30 or 40 years English foundrymen have been improving the material to secure a metal specially adapted to this purpose, much in the same way as American foundrymen have developed a cast iron suitable for the severe conditions of car-wheel service.

We have made inquiry recently as to the present status of the steel tie in Europe, and present below some information in regard to this.

GERMANY—Very little definite information has been obtained, but it is generally known that many of the state railways use steel ties extensively in main-track construction. In 1892, there were 8025 miles of track laid with steel ties, or 20% of the total railway mileage. It is stated that in 1911, the Prussian State Railways purchased 160,000 tons of these ties. The heaviest driving-axle loads are given as 40,000 lb. The heaviest ties in use are of the Haarmann type (1911 design) weighing 141 lb. each, with a length of 8.85 ft. These are shown in Fig. 1. The tie is of the trough section, reinforced by a rib on each of the lower edges, and having ribs along the top surface to form a shallow channel. In this channel rest long tie-plates, having a lug on the outer end to fit over the rail base, while the inner end has a locking lug which engages with a hole in the tie.

The rail fastening is peculiar, and requires no bolt-holes in the tie. A spring clamp is hooked over the edges of the top ribs of the tie, and its middle portion is bent to form a vertical U-shaped stem. A horizontal bolt through this stem draws the edges of the clamps tightly under the ribs. The tie is the latest development of the type invented and manufactured by Dr. Haarmann, of the Georgs-Marien Steel Works, Osnabruck, Germany.

SWITZERLAND—On the Swiss Federal Railways, the use of steel ties has been increasing steadily for several years, and the percentage of track laid with steel ties has increased from 55.4% in 1902 to 64.9% in 1911. The heaviest ties weigh 159.5 lb., and are shown in Fig. 2. At the end of 1911 there were about 90,400 tons of these heavy ties in service (or 1,247,000 ties); these were spaced about 2286 per mile, on a total length of about 546 miles (exclusive of ties of lighter weight). Of the above total, about 889,900 ties (or 64,520 tons) were used on the construction of new lines during the five years 1904-08.

It will be seen that the ties are of the familiar trough section, 9.6 in. wide on the bottom, 5.2 in. on top, and with a depth of only 3.56 in. The length is 8.85 ft. The

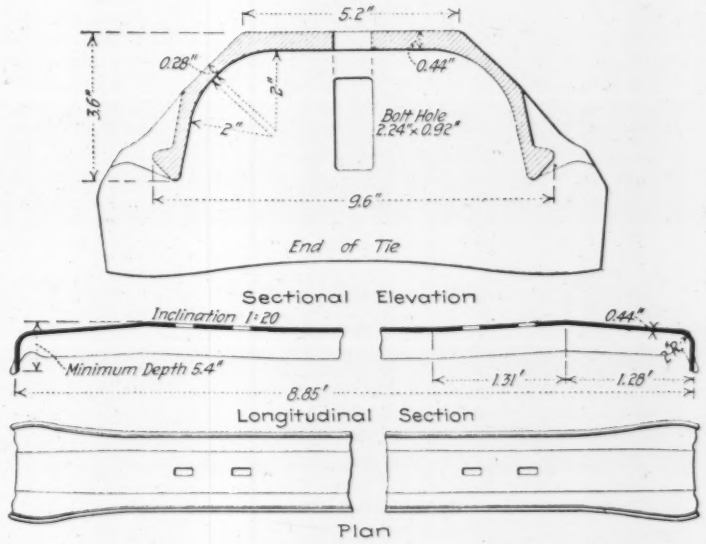


FIG. 2. STEEL TIE OF THE SWISS GOVERNMENT RAILWAYS (STANDARD DESIGN)

rails are fastened by bolted clamps, the bolts having T-heads inside the tie. The heaviest locomotives operated on lines laid with these heavy steel ties weigh 118 tons, with a maximum driving-axle load of 16.3 tons. For the above information we are indebted to Mr. von Steiger, Chief Engineer of Maintenance-of-Way. We may note that in 1894 41% of the track of all railways in Switzerland was laid with steel ties, the percentages on different roads ranging from 18% to 60%.

NETHERLANDS—It is rather surprising to learn that the Netherlands State Railways Co., which formerly used steel ties extensively, has now abandoned them. All have been removed from main tracks, and there remain only a small proportion relaid in sidings, according to a statement by Mr. Beunke, Chief Engineer of Way and Works. However, it is reported that this was due to the fact that the company simply operates the State Railways under lease, and therefore did not feel warranted in making heavy expenditures for steel ties to effect an eventual economy in maintenance which would not benefit the company if the lines should be taken over by the state. In 1894, there were about 320

miles of railway in Holland which were laid with steel ties. The ties were mainly of the type invented and introduced by the late Mr. Post while Chief Engineer of Maintenance-of-Way. These were of the trough pattern, but of unsymmetrical section, being narrow and deep at the middle and wider but shallower at the rail seats.

BELGIUM—Mr. Braet, Engineer in Chief of Maintenance-of-Way, of the Belgian State Railways, informs us that the use of steel ties has been abandoned by these railways. At one time steel ties were used extensively in Belgium, and in 1894 there were about 176 miles of track laid with steel ties. But some two years earlier reports had been made by engineers of the State Railways showing that the results were unsatisfactory as to cost of maintenance-of-way and as to behavior under high-speed traffic.

Most of the ties were similar to the Post type mentioned above, but weighing as much as 165 lb. in the heavier designs. The heaviest locomotives now in service weigh 173 tons, with a maximum driving-axle load of 22 tons.

Artificial Controls for Stream Gaging Stations

BY C. ROBERT ADAMS*

SYNOPSIS—An innovation in gaging stations for determining the flow of small streams in rough beds has been made by the hydrographic engineers of the U. S. Geological Survey as a part of its precise stream gaging work in the White Mountains of New Hampshire. Small barriers of concrete, or of rubble leveled off with cement-mortar, have been built to provide stable channel conditions. Three different types of these artificial barriers are described and rating curves for each type and for a stream having a natural control are given.

In the course of its investigations to determine the effects of deforestation upon stream flow in the White Mountains of New Hampshire, the Water Resources Branch of the U. S. Geological Survey was confronted with the problem of procuring precise determinations of stream flow over an indefinite unbroken period of time on small rough mountain streams. The desirability of eliminating all possible sources of error led to the establishment of several concrete controls on these streams at situations where the natural controls gave evidences of instability or where other conditions were unfavorable.†

The Survey's method of determining the discharge of streams by rating curves whereby a certain gage height represents a certain accompanying discharge, is too well known to require further explanation here, except for a brief reference to those physical causes which operate to render the relation between gage height and discharge a constant one. On streams with shifting channels it is well known that this relation is gradually changing, and its application to estimates of discharge must be attended with numerous determinations of the discharge at various gage heights. In general, water surface elevation at any gage location is determined by two factors, namely, the control conditions and the surface slope of the water.

Controls are channel obstructions, such as dams, waterfalls, rapids, jams, and the like, which require that the water surface shall be at a certain elevation to produce sufficient head to discharge the flow past the obstruction. Progressing upstream, the water surface increases in elevation an amount sufficient to furnish the requisite head to overcome the friction originating in the wetted perimeters of the channel. The relative importance of these two factors in producing a final gage height depends upon local conditions. As an almost universal rule, it has been found desirable, when stream gaging stations are being selected, to locate the river gage at a location close to and above a well defined and permanent control. In this way irregularities of gage height due to other causes than varying discharge, such as channel storage, are largely eliminated and the resulting dis-

FIG. 1. COVERT BROOK CONTROL DURING CONSTRUCTION FIG. 2. GIBB'S BROOK CONTROL AND GAGE HOUSE
FIGS. 1 AND 2. CONCRETE CONTROLS FOR PRECISE STREAM GAGINGS

*Assistant Engineer, U. S. Geological Survey, Washington, D. C.

†A more lengthy paper on this general subject, with theoretical discussions here omitted, was presented by the present writer at a recent conference of engineers of the U. S. Geological Survey.

charge curve or rating table becomes most nearly fixed and unchanging.

In the White Mountains but little difficulty was encountered in finding well defined controls, but in the majority of cases danger of erosion existed, banks were low or unstable, or no suitable section was at hand for current meter measurements. The advantage of installing concrete controls was apparent not only in overcoming these uncertainties, but also through enabling greater

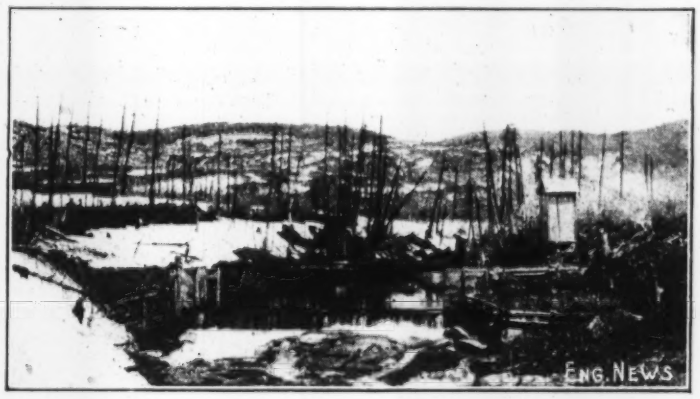


FIG. 3. CONCRETE CONTROL ON BURNT BROOK

(The log bridge is above the control, at the current meter section of the stream, at a carefully graded location. The small building contains the recording gage.)

precision of rating and the use of this standard rating for frozen as well as open-water periods.

Altogether seven controls were constructed, following three different types. The first type is that used for Gibbs Brook and Covert Brook (Figs. 1 and 2), consisting of a channel 5 ft. long, approximately level longitudinally, and with its surface composed of a cylindrical surface bounded by tangent planes. The dimensions of these controls are shown on the view (Fig. 1) depicting the Covert Brook control during construction. This control was built of rubble masonry with cement mortar and cement finish. The control at Gibbs Brook (Fig. 2) was of concrete throughout, with a masonry wingwall. Fig. 1 shows the gage well in the control, while the Fig. 2 includes the house containing the recording gage.

The second type of control was used at Burnt Brook, Shoal Pond Brook and Anderson Brook. These controls were virtually concrete dams, having a level crest length of 30 ft. and a thickness of 2 ft. The abutments were vertical, of a thickness equal to that of the crest, that is to say 2 ft., and extended 5 ft. in elevation above the crest. From that point they extended horizontally either into the natural bank of the stream or into a weil compacted earth fill. Extending down from the crest the upstream faces of the controls were vertical; the downstream faces were vertical for 2 ft. and then extended forward with a slope of 1 to 2. The foundations were either ledge or gravel filled with large boulders. The exception to these specifications is in the case of Shoal Pond Brook where the abutments, instead of having a thickness of 2 ft., were extended upstream for several feet to hold the earth fill which was extended from the somewhat distant terraces. The crests of these controls were practically level in the cases of Shoal Pond Brook and Burnt Brook. At Anderson Brook the control had a notch constructed at one side about 8 ft. long and about one-half foot lower than the remainder of the crest. Fig. 3 shows the control at Burnt Brook.

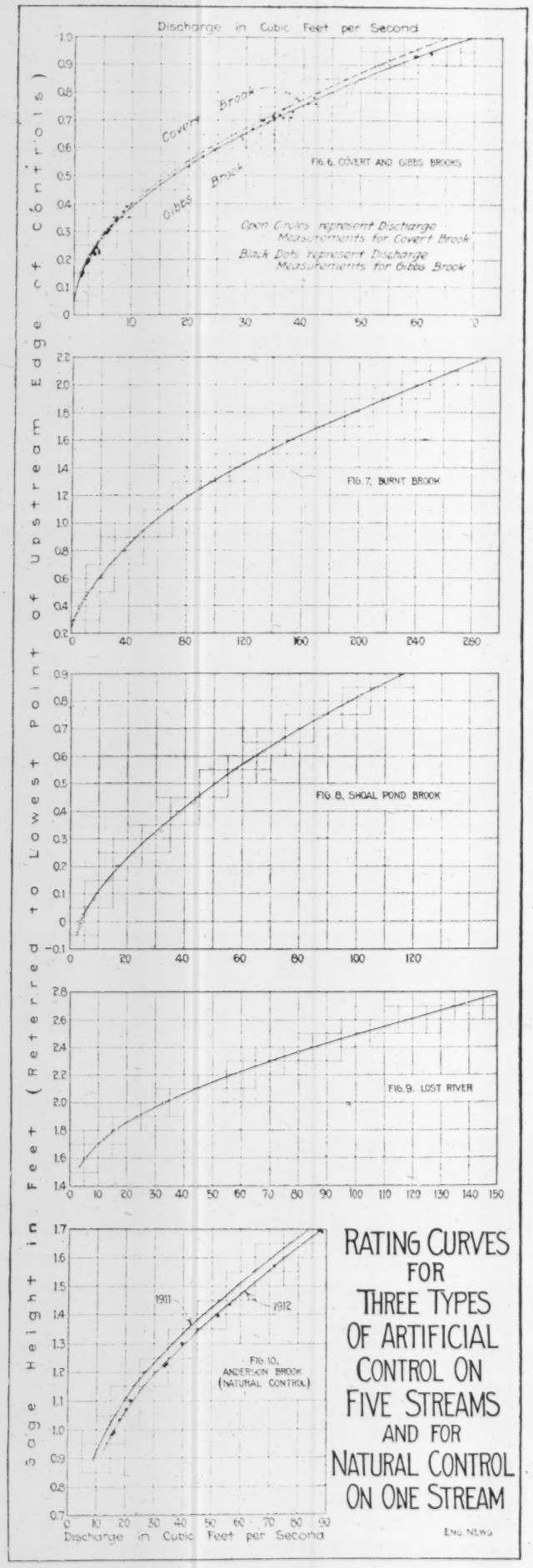
The controls at Flume Brook (Figs. 4 and 5) and Lost River were of the third type and consisted of low dams of rubble masonry set with cement mortar. They were made approximately level, extending to large boulders in the banks as abutments. Their foundations were placed down in the river bed on well compacted material or ledge, and they were built up from a base of approximately 3 ft. to a thickness of something over 1 ft. at the crest. Their construction was done rapidly and without adherence to geometric design. Lines were placed across the channel indicating the upstream and downstream edges of the control crest; and the rubble masonry was carried up to them, finishing with a smooth layer of cement mortar. The water in both cases was diverted through the river bank at one end, coffering of sand bags being used for the area containing the control. Leakage through the coffering was handled with a single diaphragm pump operated by hand.

FIG. 4. STREAM BEFORE CONSTRUCTION

FIG. 5. AFTER CONSTRUCTION

FIGS. 4 AND 5. FLUME BROOK CONTROL

As already suggested, these controls were constructed to fill a varied purpose, principally to insure a permanent relation between gage height and discharge, to provide suitable means for measuring discharge, and to facilitate winter estimates during the frozen period. How the first two of these purposes have been served is illustrated by the accompanying rating curves. Fig. 6 shows the curves for Covert Brook and Gibbs Brook stations with attendant measurements of flow. As would be expected, the curves very nearly coincide in position. The increased


Discharge in Cubic Feet per Second
Gage Height in Feet (Referred to Lowest Point of Upstream Edge of Controls)
FIG. 6. COVERT AND GIBBS BROOKS
Covert Brook
Gibbs Brook
Open Circles represent Discharge Measurements for Covert Brook
Black Dots represent Discharge Measurements for Gibbs Brook
FIG. 7. BURNT BROOK
FIG. 8. SHOAL POND BROOK
FIG. 9. LOST RIVER
1911
1912
FIG. 10. ANDERSON BROOK (NATURAL CONTROL)
Discharge in Cubic Feet per Second
RATING CURVES FOR THREE TYPES OF ARTIFICIAL CONTROL ON FIVE STREAMS AND FOR NATURAL CONTROL ON ONE STREAM
ENG. NEWS

discharge at Gibbs Brook is supposed to be produced by a slight downward slope through the control, amounting to 0.06-ft. in 5 ft. At Covert Brook the downward slope amounts to but 0.01-ft. in 5 ft. Apparently there was but little difference in velocity of approach in either case, although such velocity of approach became considerable at higher stages than are represented on the diagram.

Figs. 7 and 8 show ratings for Burnt Brook and Shoal Pond Brook with controls of the second type.

Fig. 9 shows the rating curve for the Lost River station, which was of the third type. This curve is based on ten current meter measurements made by six different observers.

Fig. 10 shows the rating for a natural control. It is for a secondary gaging station on Anderson Brook with a natural control of compacted gravel. Erosion at the control, approximately 0.04-ft. in average depth, has caused a shift in the curve for 1912, moving it to the right of that for 1911. Such a small erosion is seen to be of consequence in affecting precision of results on these streams. A similar effect was noted on Zealand and Ammonoosuc Rivers in the White Mountains. During the fall of 1911 one curve for rating was determined for these two streams. In the early medium stages of the following spring this curve did not apply but the control had apparently lowered, affecting the curves by approximately 0.05-ft. in elevation, which would be equivalent to a scouring action on the control of that amount. After high water had passed, and during the month of June, both rating curves shifted back to their positions for 1911, which would be equivalent to a silt accumulation on the controls equal to that previously removed by the high water. The action may be explained by supposing that during high water material is transported down the channel. The controls are cleared of their finer deposits and the rating curve is correspondingly changed. During low stages the material in suspension brought from above gradually precipitates and tends to refill the controls, again changing the rating curves.

The result is that for streams like Ammonoosuc and Zealand Rivers the rating curve after high water will be permanently in one position, but at low stages it will be anywhere on a fan-shaped extension, dependent upon the conditions of silt accumulation at the control.

Emphasis should be placed upon the quality of the measuring equipment accompanying these controls. For measuring the small discharges occurring at Gibbs Brook and Covert Brook during periods of low water an equipment was installed consisting of a hinged spout leading to a water tight box, 5x5x5 ft. inside measurement. Determinations of discharge were made by raising the spout and allowing water to enter the box for a certain number of seconds. Then the spout was lowered and the quantity of the water in the box measured. The spouts were either operated by hand or by a lever operated over a pair of lightly constructed shear legs. Difficulties in preventing leakage were met but were successfully overcome. The agreement of individual determination of discharge by this method is well exemplified in the rating curves. For the larger streams metering sections were graded, usually with the bottom of the gaging section about 1 ft. below the crest of the control.

The diagrams illustrate both the permanency of the ratings at these stations and the quality of the metering. As for the use of controls during the winter, their value

is at once evident. Ice accumulations occur on the controls only in very cold weather, and may then be removed with an ice chisel without damage to the control. When cleared of ice, the open-water rating curve may be applied to the observed gage height. On streams with natural controls this has not been possible, but ice forming on them has of necessity been left to accumulate, causing backwater at the gage and rendering the open-water rating of no value. At such times it has been necessary to make a complete current meter measurement to determine the discharge, whereas with the concrete controls it was only necessary to observe a gage height.

The accompanying view (Fig. 11) of the Lost River control, taken on Jan. 16, 1912, illustrates a peculiar characteristic noted at these controls when left undisturbed in winter. Field notes taken at the time of the photograph are added to explain this feature:

On Jan. 8, 1912, a visit was made to Lost River, Jackman, Pike and Moosilauke gaging stations and photographs taken of conditions. Each station was found entirely covered with snow and ice. A small opening was observable at the Lost River control and another at the upper end of the cleared section at Jackman Brook. Otherwise the streams were entirely covered.

FIG. 11. LOST RIVER CONTROL IN WINTER

From Jan. 8 to 16, 1912, the weather was extremely cold generally, warming up somewhat on Jan. 10 and 16. On the former date the maximum temperature at North Woodstock reached 33°. Other than that it was always below freezing temperature.

On Jan. 16, 1912, a trip was made to Lost River and Jackman Brook. Jackman Brook was found entirely frozen and snow covered, even including the small place formerly open. Yet on Lost River the ice had melted at the sides above the control, leaving long lanes of open water 3 or 4 ft. wide. In the center of the stream was a long slab of floating ice averaging about 6 in. in thickness. Photographs were taken of the conditions. The staff gage was read and was found to be 1.62 at 11 a.m. The control was entirely out of sight under snow and ice.

In the afternoon the control was cleared of ice and snow. It was found that the water had worn itself a channel under the ice and was flowing over the entire length of the control and without any backwater effect. Yet above the water was an ice layer 4 in. or more thick surmounted by about 2 ft. of snow. After clearing the control entirely the staff gage read 1.62 at 3:40 p.m., the same as in the morning.

The building of these concrete controls for river gaging stations was an innovation with the U. S. Geological Survey. For that reason no attempt was made to construct all alike, but differences were looked upon with favor in order to indicate from experience which type gave greatest satisfaction. The results show that the particular type must be designed for particular needs. The value of having standard ratings for certain types is, however, well recognized. Under such circumstances estimates of flow could commence immediately with the installation of the station without the necessity of waiting for sufficient ranges of stage to occur to permit the determination of the station rating.

In conclusion the advantages of artificial controls may be enumerated as follows: (1) Fewer current meter measurements are required for the initial rating. (2) The initial rating is of increased accuracy. (3) The rating curve is permanent and not subject to change from erosion or sedimentation. (4) Temporary inaccuracies due to backwater or channel storage are obviated. (5) Winter estimates of flow can be made with precision comparable with those of the summer. (6) The period of doubtful accuracy occurring during the early winter freeze-up is eliminated. (7) Any derangement of conditions at the gaging station is at once observable by inspection. (8) Greater latitude of station location is possible.

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The Bureau of Municipal Research of Milwaukee, Wis., was created in September, 1912, to take the place of the former Bureau of Efficiency and Economy, recreated during the recent Socialist administration, and which the present administration claimed had no legal status. The new Bureau is headed by a director at a salary of $3000 a year, who is assisted by an assistant at $1800 a year. The director is charged with the duty, under the direction of the comptroller, of devising accounting systems for the various city departments, and of auditing city accounts. It is also the duty of the director, in this case under the direction of the mayor, "to apply tests of efficiency of departments and persons in the service of the city; to gather and tabulate all available statistics of municipal governmental activities that in his judgment or in the judgment of the mayor may be of service or benefit to the city, whether such governmental activities apply to the city or not," and he shall make monthly reports to the Mayor, showing the result of the work of the Bureau and an annual report to the common council.

Locomotive Terminal Facilities in large cities usually include extensive coaling and coal-storage plant. A report on "Modern Coaling Stations" presented at the recent annual meeting of the International Railway Fuel Association, in Chicago, suggested the advisability of keeping such plants away from city terminals. We quote below this portion of the report:

Modern coaling stations should not be located at the large centers of population wherever this can be accomplished without too great expense. It is believed that it will always prove economical to locate coaling stations away from terminals a distance equal to that which can be covered by one locomotive tank supply, and that no engines, except possibly one or two fast passenger engines, be coaled at the larger terminals.

This conclusion is reached after carefully considering the delay and cost due to stopping passenger trains for coaling purposes, and also after giving due consideration to the desirability of having all of the motive-power activities of a division consolidated under one general supervision. Like all other rules, this one has its exceptions. It would not be economical to so locate a coaling station where the fuel was being delivered at the terminal in question, as it would mean dead haul of loads and empties for double the distance between the terminal and the coaling station.

Additional factors for careful consideraton are: (1) grade conditions, (2) density and directions of traffic, (3) junction points, and (4) location of supply. The most elastic temporary or emergency coaling plant that can be established is the locomotive crane. This is particularly so where property values are excessively high, and where it is desired to store an emergency supply on the ground from time to time. In fact, there are some who advocate this method of handling locomotive fuel at all points and under all conditions.

Repair of an Old Brick Tunnel Lining

During the last few years a double-track railway tunnel near Hönebach, Germany, on the line from Weissenfels to Bebra, whose brick lining had become dangerously out of repair, was put into good condition at a cost of $225,000. As the tunnel is almost exactly 1 km. long, the cost of the work amounts to about $360,000 per mile. The date of original construction is 1845-1848; the age of the structure makes the repair work particularly interesting. It is described in "Zeitschrift für Bauwesen,"

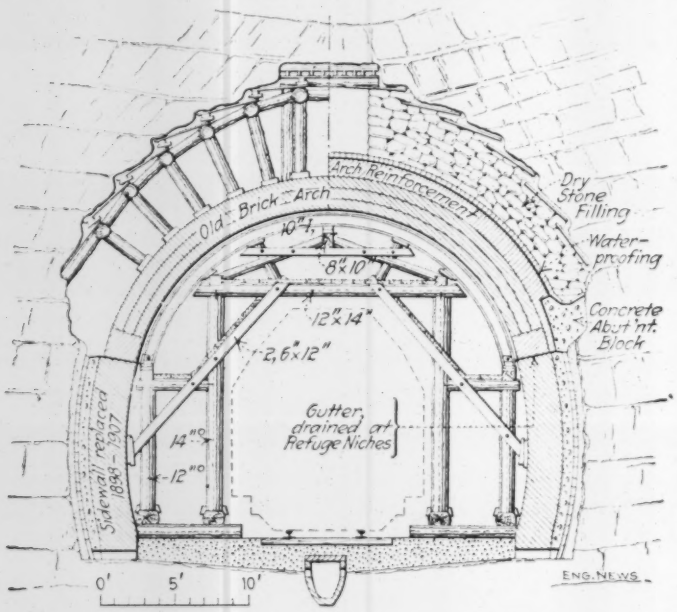

FIG. 1. REINFORCING AND WATERPROOFING THE DOUBLE-TRACK HÖNEBACH TUNNEL, GERMANY

No. 1, 1913, by R. Loewel and E. v. Willmann, who were in charge of the work.

The tunnel was originally built under the direction of Belgian engineers. The Belgian method was used with advance of the bottom heading from the portal and five intermediate shafts. The lining was brick, in three to four rings not bonded together, laid up in a lime-sand mortar with a small addition of powdered brick, except that the key section of the arch was laid in cement mortar.

The ground overlying the tunnel is wet, and the lining leaked considerably from the beginning. The inflow of water and the resulting leaching of the mortar and disintegration of the brick, together with ice troubles in winter, led to many and long-continued attempts at repairing, including patching the brickwork, grout injection into the brickwork and into the stone backing, etc.

More thoroughgoing reconstruction became necessary, and it was begun in 1898 with rebuilding of the side-walls below the springing of the arch; a 28-in. limestone wall backed with 8 in. of concrete was substituted for the old side-walls. This had to be done in short sections, so as not to interrupt traffic, and on this account it took nine years, being completed in 1907. Repair or replacement of the arch could then be undertaken.

Removal of the old arch and construction of a new roof would have blocked the tunnel (or at least restricted it to single-track operation) for several years. It was believed that the old lining was good enough to warrant repair, and that this need not interfere with double-track operation; while the condition of the arch was threatening, yet an examination indicated that little more than the inner ring required renewal. It was expected that suitable repair operations would be much cheaper than reconstruction, could be done in less time, and would not interfere with use of the tunnel. As matters turned out, the repair involved more difficulties than were anticipated.

The method of repair decided upon was to drive a 5x6-ft. heading over the top of the arch for the full length of the tunnel, and then, proceeding in alternate sections 10 ft. long, open out laterally on top of the arch ring down to the spring line, repair all damaged or disintegrated spots and add a reinforcing layer to the arch, apply waterproofing, and complete the work by filling the void above the waterproofing with dry-packed stones. It was felt that this method would give sure results as compared with very doubtful results in case of grout injection. The adopted plan included repair of the inner ring or rings of the lining after the exterior was repaired and made safe by the process described.

The work was carried out under this plan by contract. The crown heading was driven between August, 1908, and October, 1909, without incident. The operations of widening out, repairing and waterproofing were begun near the middle of the tunnel and carried back toward the ends, work being in progress on a length of about 100 ft.

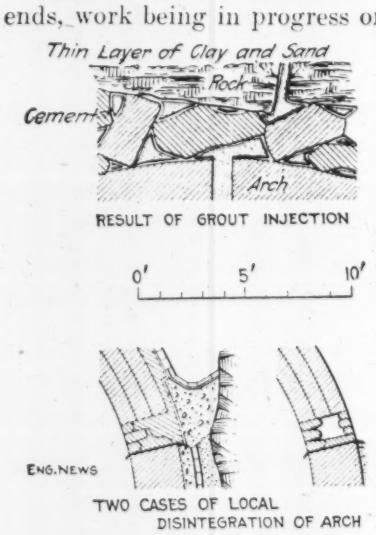

FIG. 2. HÖNEBACH TUNNEL REPAIR

of tunnel at any given time. Alternate 10-ft. sections were widened out, the drifts timbered, and the reinforcement and waterproofing done. The intermediate section between two successive drifts was excavated after these two drifts were again closed, and at the same time the corresponding part of the crown heading was treated. Under this working plan a rate of advance of about 4 ft. per day at each end of the tunnel was achieved.

Some trouble developed at an early stage of this work from settlement of the overlying rock and squeezing of the timbering in the heading on account of the impossibility of doing the dry packing so thoroughly as to make it take its share of the load immediately. Much crushing of the crown bars and posts was noted, and in one case a post was punched through the arch masonry, which at this point was 30 in. thick but was in poor condition. Also, due to slight lateral yielding of the skewbacks of the arch, cracks developed in the crown,

within a month after the widening-out was begun. This effect was traced to the fact that when the restraint of the arch by the overlying rock was removed by means of the excavation for waterproofing, the arch distorted slightly. The difficulty was remedied (at first only in one section but subsequently throughout the work) by forming a concrete abutment and gutter behind the skew-back of the arch on either side of the tunnel. This was necessary not only to support the arch thrust but also to take care of the drainage back of the arch, as it was apparent that the drain courses back of the sidewalls were not taking care of this drainage, and continued to allow water to leak into the tunnel even after complete waterproofing of the arch above the springing line.

The most serious difficulty was encountered a few months later, when the work was threatened by the incipient failure of the lining of one of the ventilating shafts (originally a construction shaft). The foot of this lining failed by crushing and telescoping, and there were signs that the arch masonry below and around it was also practically at failure. Operation of trains through the tunnel would have been discontinued at once except for the importance of the line, but single-track operation was immediately instituted (the operating track being shifted to the middle line) and heavy bents of centering were set to support the arch. It was then necessary to reconstruct the shaft lining and its connection to the arch, a difficult piece of work which had to be done under the protection of complete sheeting held by frame rings made of old rails. In renewing the shaft masonry great care was used to obtain tight contact between the lining and sound rock, after cleaning out all soft rock and loam, in order to avoid the likelihood of water draining down between masonry and rock and accumulating over the arch under pressure.

Repair of the inner face of the arch was started only after all the waterproofing and backfilling was completed. This was done under a contract which provided that wherever the inner ring of the brickwork was structurally sound it was to be coated with a cement-mortar facing, and wherever it showed deterioration the brickwork was to be removed and replaced to the depth of disintegration, and also coated with cement-mortar facing.

In some earlier repair work in this tunnel a cement-mortar facing had been applied by placing the mortar directly on the centering and laying the arch repair masonry upon this mortar bed, so that when centers were struck the mortar remained adherent to the brickwork. This facing proved to be very durable and to give effective protection to the arch. The same method of placing was therefore adopted for all parts of the later work where brick-work had to be renewed.

In applying the cement facing to that part of the brickwork which was still in good condition, it was found necessary to finish it to a smooth surface. Early parts of the work put on with a rough surface soon developed white spots and efflorescences, which upon examination proved to be centers of disintegration. Chemical analyses indicated that the effect of the locomotive gases was responsible for this disintegration. The trouble did not appear where facing was floated smooth instead of being left with a rough surface. In those parts of the facing which were put on simultaneous with replacement of some of the brickwork, the facing mortar was laid up on the centers with the brickwork, as already described, and in this case the cement attained a sufficient set before striking centers to be no longer affected by the gases.

In the course of the waterproofing of the back of the arch there was opportunity to examine the efficacy of some earlier grout injection work, which had been undertaken in the attempt to reduce or abolish the leakage of water through the arch. It was found that all loose stone was coated with a fine layer of clay and sand, and the grout which was forced into this mass had only filled the interstices without making tight contact with the individual pieces of the stone packing. The result was that the water again soon leached out passages and channels in the mass and in a short time no effect of the grout injection remained. The condition of the grouted work is illustrated by one of the sketches in Fig. 2 herewith.

The total cost of the repairs described above included: Roadbed, track and signal work to the amount of M. 50,000; Brick, cement, stones, waterproofing, and other material, M. 200,000; Contract labor, M. 650,000. The total cost was M. 900,000, or approximately $225,000.

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A Cableway Up Mt. Blanc is to be built for passenger service under direction of Prof. von Salis, son-in-law of the late Mr. Guyer-Zeller, of Zurich, the projector of the Jungfrau Ry. This cableway is to be built in four sections. The first section has a rise of 653 m. in a horizontal distance of about 2 km. The cables are carried on 27 steel towers 10 m. to 25 m. high. The minimum gradient is 15% and the maximum is 85%. The second section makes a vertical rise of 743 m., terminating at the Glacier des Bossons. This section has an average gradient of 63%. The third section, about 1 km. long, terminates at the Premiere Arete and has a mean gradient of 67%. The fourth section, terminating at the Col du Midi has a total rise of 760 m., or a maximum grade of 60%. The cars to run on the line each carry 20 passengers. The two supporting cables on each section are parallel and about 4 m. apart. One car rises while the other descends, an endless hauling cable controlling their movement. The steel carrying and hauling cables are 64 mm. and 32 mm. in diameter respectively. The two lowest sections are expected to be completed by 1914.

Engineering work in Philadelphia municipal affairs seems to have been of little account during the era of political management of the city's affairs, but the Blankenburg administration has instituted a number of reforms which promise to give a proper prominence to the engineer.

The Bureau of Highways and Street Cleaning of the Philadelphia Department of Public Works, has the responsibility for the maintenance of all roads and streets within the city limits, including over 1000 miles of paved streets and nearly 300 miles of macadam road, as well as 180 miles of earth roads. The Bureau also has charge of all repaving and street reconstruction, of the construction of parks and boulevards, of street cleaning, and the collection of ashes and garbage over the entire city and of the maintenance of all the city's sewers and of all the city bridges, aggregating an investment of over $21,000,000.

Although practically all this is engineering work, Mayor Blankenburg's administration when it took charge of affairs, found that out of the 266 persons engaged in the administrative work of the Bureau, outside of laborers, foremen, etc., only one was ranked as an engineer, and he was receiving the munificent salary of $1500 per annum. This lone civil engineer was assistant to a man without engineering education or experience.

In the reorganization of the Bureau under its present Chief, Wm. H. Connell, the work which the Bureau carries on has been placed in charge of an engineering force, made up of 15 assistant engineers, 17 engineering inspectors and 80 ordinary inspectors, nine-tenths of whom are also engineers. Temporary inspectors are also employed at $100 per month during the construction season. A scale of salaries and positions has been established, under which there are four grades of inspectors at $1200 to $1500 per year and five grades of assistant engineers at $1500 to $4000 per year. In the future it is planned to fill these positions, when vacancies occur, chiefly by promotion from the lower grades after the examination of candidates by the Civil Service Commission.

New Shops of the Canadian Pacific Railway near Calgary, Alberta, Canada

The Canadian Pacific Railway has recently put in operation near Calgary, Alberta, Canada, a large shop plant of more than ordinary interest by reason of its size, its modern design and the speed with which it was constructed. Its location is at Ogden, 4½ mi. from Calgary, which is 2250 mi. from Montreal. Its distance from those sections of the continent where the greater part of the construction materials, machinery and equipment were produced, constituted the first and one of the most important problems. A second important problem arose on account of the construction season being extremely short owing to the high latitude, frost remaining in the ground until about Apr. 1 and returning with snow as early as Oct. 1. A third very important problem was the comparative scarcity of labor in the Canadian Northwest, this condition being greatly aggravated during the late summer months when harvesting begins and all labor markets are practically drained of men.

Plans had, therefore, to be drawn, materials ordered, deliveries made and a complete field force organized so that the shops could be closed in between Apr. 1 and Dec. 1 and sufficiently heated so that inside work could be continued after the cold weather had set in.

Description of Shops

The erecting shop which is 778x75 ft., is served by two traveling electric cranes carried on two levels. A 120-ton crane furnished with two 60-ton trolleys is carried on the upper level and is used for transferring and wheeling and unwheeling locomotives. One of the trolleys on this crane is equipped with a 10-ton auxiliary hoist for handling light material at a high hoisting speed. Another 10-ton traveling electric crane operates at high speed and serves the entire area of the erecting shop, for handling material in that shop and transferring it to the blacksmith shop and machine shop. The machine shop and the boiler shop are located in adjacent bays on either side of the erecting shop.

Provision is made on the crane columns in the erecting shop for attaching portable jib cranes for use in dismantling and erecting material on the front ends of locomotives. These cranes are placed where desired by means of the overhead traveling electric cranes.

The machine shop for heavy machine tools is located parallel with and adjacent to the erecting shop. It is 60-ft. 9 in. wide and the same length as the erecting shop. A high-speed traveling crane of 10-ton capacity covers the entire area of this shop. Material can be brought into the shop through a door provided in the end of the building, the material being brought up to the end of the machine shop by the electric yard crane which travels across the end and outside of the locomotive shop.

Space for the lighter machine tools is provided in a shop having the same dimensions, parallel with and alongside of the heavy machine shop. Provision has been made for a foreman's office elevated above the floor and having a liberal glass surface in the walls so as to give the best possible view of the shop.

The blacksmith shop is located alongside of and parallel with the erecting shop on the opposite side from the machine shop.

The space for the boiler shop is provided in a two-bay building, alongside of and parallel with the erecting shop at the end of the blacksmith shop, 352 ft. long and the same width as the latter shop.

The riveting tower is located between two of the roof trusses in the end of the boiler shop, with a 25-ton crane for serving the hydraulic riveter.

An entrance track is provided through the outside wall of the boiler shop on which boilers or other equipment going to this department can be delivered on cars under the traveling crane, for unloading, or may be loaded out for shipment in the same way.

The heating throughout is done by the indirect-fan system. For distributing the heated air, underground concrete and tile ducts are used.

The general illumination consists of Cooper-Hewitt lamps with circuit and plug boxes for extension loop cords. Provisions have also been made for incandescent lighting circuits for individual lighting at machine tools where required, and for outlet boxes for connecting extension lamp cords to provide lighting for the interior of the locomotive boilers on the erecting floor.

A suitable system of piping is provided for distributing live steam, compressed air, fuel oil and also water for fire protection, drinking and hydraulic pressure.

Outlets for compressed air are provided in duplicate in the sides of each of the engine pits to supply compressed air for operating pneumatic tools.

In the main locomotive shop the electrical feeders from the power company's transmission lines are carried in underground ducts, bringing the current at the voltage delivered by the power company, viz., 2200 volts, to a substation located adjacent to and immediately outside of the low machine bay, the transformers for stepping down to 440 volts being located in this substation. Here also are located two direct-current motor generators. The switchboard for controlling the power and lighting circuits in the machine shop and for the tender shop and foundry is also located in this substation. As far as possible distributing feeders are carried in conduit beneath the shop floor, thereby minimizing the amount of exposed wiring in the shops.

The building containing all of the above departments of the locomotive shop is constructed with a structural-steel frame carried on concrete foundations. The exterior walls up to the window-sill line are of concrete and above the window sills are of hollow-tile, plastered.

With the exception of the blacksmith shop and a portion of the boiler shop the floor throughout is constructed with a 1½-in. asphalt mastic wearing surface which is underlaid with a rough concrete slab about 6 in. thick. In the blacksmith shop and a portion of the boiler shop the floor is of cinders.

The roof sheathing is constructed of 2x4's, surfaced on one side and one edge and spiked together on edge, thus affording good fire-resistance qualities and materially reducing the heat losses. The roof water-proofing is four-ply tarred felt, pitch and gravel, with copper flashing.

The tender and wheel shop is constructed with a structural-steel frame and with steel roof trusses; otherwise the general construction of the building is similar to that described for the main locomotive shop. It is an L-shaped structure 263x80 ft. with an L 180x80 ft., and affords space for making repairs to locomotive

tenders, steam-shovels and other maintenance-of-way equipment.

Space for the pattern shop and pattern storage is provided in a separate building located adjacent to the foundry, a fire wall separating the pattern shop from the pattern storage. The general construction of the building is the same as that of the other buildings—the roof of slow-burning mill construction. The structure is 162x31 ft. and is heated by the direct system and lighted with keyless-socket marine type incandescent lamps. A sprinkler system is provided for fire protection.

The gray-iron foundry building is 203x80 ft., constructed with two bays. The frame is of structural steel carried on concrete footings. The general construction is the same as that described for the other building except that the floor is of the usual clay type used in foundries and the roof over the cupola room is of corrugated asbestos. Heating is by the indirect-fan system with underground tile and concrete hot-air ducts. For general illumination flaming arcs are used in the high bay and in the low bay, with outlet boxes for extension lamp cords.

The storehouse and office building is 252½x60 ft. The walls are constructed of hollow-tile blocks on concrete foundations which are carried up so as to bring the floor of the storeroom to the car-door height.

For storing and distributing oil a separate building is provided convenient to, but located far enough away from, the storehouse and other buildings to eliminate the fire risk. It is constructed with tile walls (plastered on the exterior) on concrete foundations, with a concrete basement at one end for the tanks which contain the oil for local distribution. The roof is of reinforced-concrete slabs, as is also the floor of the pump room over the basement. That part of the building used for storing oil in barrels has a cinder floor. The pump room is partitioned off with a brick wall carried up to make a fire wall.

The oilhouse basement is heated by the direct system to the temperature necessary to render the oil fluid during extreme cold weather; the direct system being also used to heat the rest of the building. The lighting of the building is with keyless-socket marine type incandescent lamps. There is fire protection in the form of sprinklers.

The coach repair and paint shop, of which a photograph is shown, is 362x146 ft. and has fifteen tracks on 24-ft. centers. It is constructed with hollow-tile carried on concrete foundations. Heavy timber posts support the roof, which is of slow-burning mill construction. Otherwise, the construction is the same as that described for the main shop building.

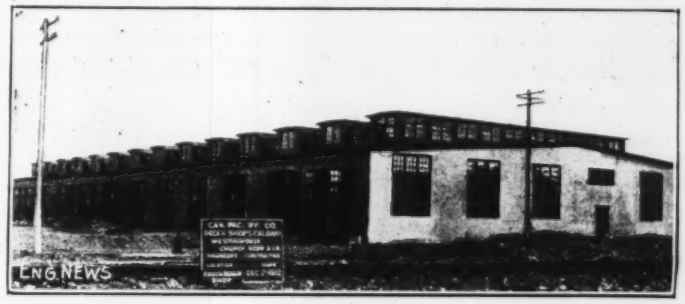
Heating is by the indirect fan system and the lighting is by incandescent lamps. Compressed air, steam and water service and automatic sprinklers are provided.

The freight-car repair shop, 303x231 ft., is supplied with compressed-air and steam and water service piping, heated with the indirect fan system and lighted by 100-watt tungsten lamps.

Two eight-inch wells equipped with electrically operated pumps have been put down, for obtaining water for shop purposes. To supplement this supply and to provide a main source of supply for fire protection, the city of Calgary has brought down into the shop site to a point midway the length of the main shop building on the west side a ten-inch cast-iron water main. The shop service and fire lines are connected into this main and into a steel tank of 125,000 gallons capacity, which is erected on a 70-ft. steel tower, principally for use in connection with automatic sprinklers in the various buildings where these are installed.

Progress of the Work

The location of the shops, as previously stated, is about 4½ miles east of Calgary, practically on the open prairie and before beginning construction, arrangements had to be made to house and board on the shop property a considerable labor force. To this end, frame bunk-houses were erected with two tiers of bunks on each side of the building, eight bunks long, each house having a capacity of 32 men. Stoves were placed in the center aisle and benches along the sides of the lower tier of bunks. With the approach of summer, and as the labor forces were increased, some of the men were housed in standard 12x14-ft. wall tents which accommodated four men each. A large mess room with kitchen and storeroom space was



Coach-Repair Shop; Canadian Pacific Railway Near Calgary, Alberta, Canada

fitted up with a capacity for feeding about 400 men at one time.

As there were no accommodations near the shops for men with families, the Railway Company put into temporary service a train to carry the men back and forth from Calgary, and several hundred men went back and forth on this train each day. This arrangement helped the situation considerably, especially as the season advanced and all kinds of labor became more difficult to obtain. A standing order was placed through several labor agencies in Calgary to send men daily to the job. As the work neared completion the bunk houses and mess house were turned over to the Railway to take care of their own men who were at that time living in cars on the property. This, of course, released the cars and permitted their use at other points.

The work was designed and built in its entirety by Westinghouse, Church, Kerr & Co., consulting and constructing engineers, of Montreal and New York, working under the direction of Mr. J. G. Sullivan, Chief Engineer of the Western Lines of the Canadian Pacific Railway, and Mr. N. E. Brooks, Division Engineer.

The progress schedule below will show the prosecution of the work but it should again be pointed out that it was not possible to break ground until Apr. 1, 1912, and by Mar. 17, 1913, the locomotive shop was in full operation. When the magnitude of the work is considered as also its distance from the larger centers, it will be appreciated that a record for prompt performance has been established.

The progress of the work was as follows:

	Commenced 1912	Completed 1913	Duration of job in months
Locomotive shop	Apr. 15	Mar. 15	11
Tender shop	Apr. 15	Mar. 15	11
Coach shop	Apr. 15	Mar. 15	11
Power house	May 15	Jan. 15	8
Storehouse and offices	June 15	*Dec. 15 *(1912)	6
Freight car shop	Apr. 30	Mar. 31	11½
Foundry	July 15	Mar. 31	8
Planing mill	Apr. 30	Feb. 28	10
Pattern shop and storage	July 31	Jan. 31	6

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Modern Steel-Tipple Design*

By John A. Garcia†

Steel structures have been built in the Illinois and Indiana coal fields only during the past ten or fifteen years and have not been generally adopted in either of these states, except that fireproof structures are now required by law in Illinois. At the same time there has been a steady progress in the West toward more substantial construction and toward mines designed for greater safety and longer life. This fact, together with the demand for better preparation of the product in addition to the more recent requirement of law, has led to a very interesting development of this line of engineering.

The keystone of a mining installation is the shaft and tipple. In the old days the shaft was put down in the cheapest possible manner; small, cramped and timber lined. The tipple was placed immediately on the curbing or just outside of it. The tipple usually consisted of six heavy vertical timbers placed at the corners of the two hoisting compartments, braced laterally by batter braces and carrying the sheave wheel on cross timbers at the top. A heavy timber brace was then framed between the sheave deck and the engine foundations. The weighhouse was supported by similar bents placed between the tracks and the screens were hung or supported underneath and covered by a loading shed. When shaker screens began to come into use it was found necessary to support them on an independent interior structure, as it proved very difficult to produce and maintain a timber structure of sufficient rigidity to prevent the vibration of the screens from affecting the scales and seriously damaging the main structure.

The first steel tipple followed almost exactly the lines of the accepted wooden structure. At least six steel columns were placed on or adjacent to the curbing, the screens were carried on an independent structure, and the batter braces were connected as formerly. The whole structure was interwoven with a network of light angle bracing. The actual working stresses in the tower, when first calculated, were found to be surprisingly small and the required sections extremely light. But the first designers did not realize that steel is a very elastic material, and that a structure of sufficient theoretical strength, which could be built for a cost approximating a well constructed wooden tipple, would lack entirely the rigidity necessary for satisfactory operations under the shock of hoisting and dumping and the constant vibration of the screens.

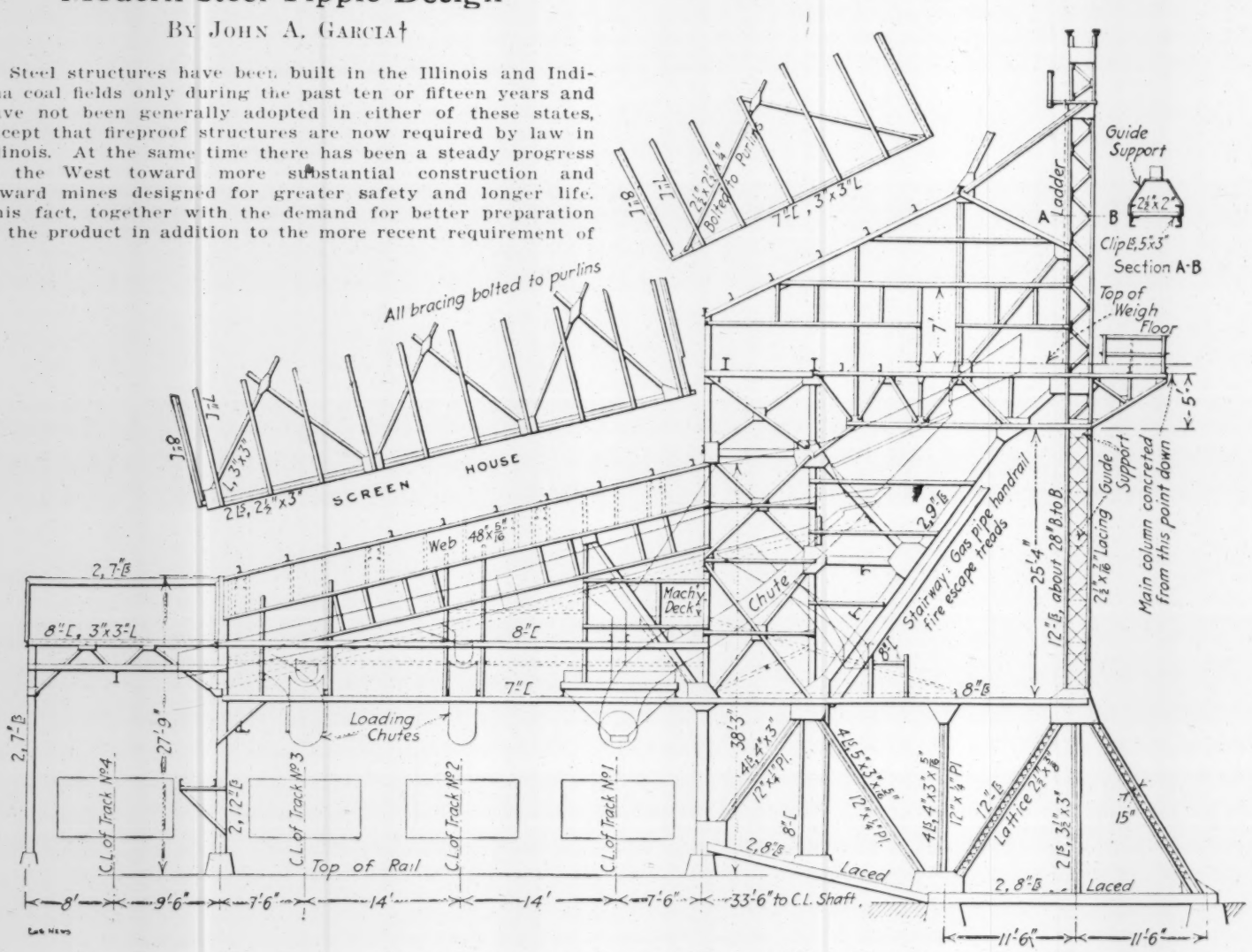

FIG. 1. NEW TYPE OF STEEL TIPPLE AND SCREEN HOUSE; WEST KENTUCKY COAL CO.
(John A. Garcia, Chicago; Inventor; Allen & Garcia, Chicago, Engineers.)

It is not surprising, therefore, that the first steel structures were distinctly less rigid and satisfactory than their wooden predecessors. They had one advantage in that they were fireproof. The freedom from shrinkage and rotting was offset by the rusting of the metal and the extreme liability of the light members to damage from accident. Any damage to the shaft, any settlement around it, or fire in the curbing had almost as destructive an effect on the tipple as if it had been built of wood, and coal operators began to wonder whether even the small increased cost of steel was worth while.

The first step toward the construction of a steel tipple distinctly superior to wood was the A-frame design, in which the legs of the tower are carried onto firm ground well away from the shaft. Another improvement introduced about the same time, consisted of spanning the tracks with a clear span and carrying the screens on a bridge, so as to avoid the inconvenience and danger of columns located between the tracks. The first A-frame tipples, so far as the writer knows,

*Abstract of a paper read at the Mining Conference at the University of Illinois, May 8, 10, 1913.

†Allen & Garcia Co., Engineers, McCormick Building, Chicago.

were designed by Andrews Allen in 1899; and the first bridge for carrying the screens, by George S. Rice, at about the same time. Since that time it has become almost the universal practice of designers (even when the old six-column towers are employed) to carry the foundations well away from the shaft; and the clear span over the tracks, while not generally adopted, has been coming more and more into favor.

The A-frame tipple, while a distinct improvement over previous construction and greatly superior to the wooden structure in strength, permanence and rigidity, had some serious drawbacks. The guides had to be carried inside of a widely spreading tower by means of substantial horizontal frames; and these frames, even if of sufficient strength, were particularly liable to damage and corrosion and, when really built for permanence, added greatly to the cost of the structure. In this respect the old form of six-column tower, when the footings are carried a sufficient distance outside the shaft, still has an advantage over the A-frame type, although

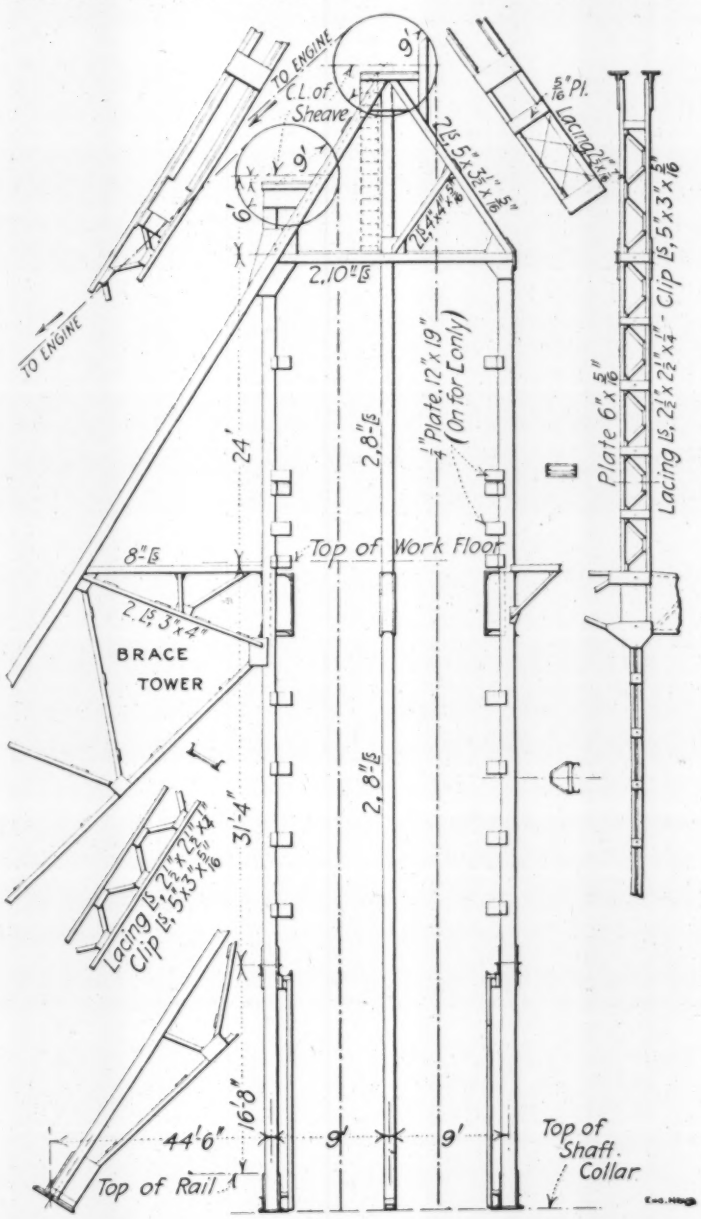

FIG. 2. FRONT ELEVATION OF STEEL TIPPLE, WITH BRACE TOWER ON ENGINE-HOUSE SIDE

this advantage is neutralized by the greater complexity and the indeterminate character of the structure.

In all these designs the independent screen structure was a uniform feature. The effect of the vibration of the screens was so little understood and so inadequately analyzed that none of the designers appeared to be brave enough to break away from the prevailing practice and design a structure that should be stiff and strong enough in all its parts and with the unavoidable vibration so localized that no damage could come to the structure or inconvenience to the operation of the scales.

In the meantime there came a development in the direction of concrete shafts. This construction not only removes the danger of fire, but makes the shaft curbing (in most cases) the best and most substantial as well as the least expensive foundation on which to place the tower. Thus the principal advantage of the A-frame structure was removed.

About two years ago, the Allen & Garcia Co. took up the problem of building a tipple over a concrete shaft and decided to place the main column members directly on the curbing. We were unwilling to revert to the six-column design, on account of its complications and ambiguity of stress, and finally a system of construction was evolved (and protected by patents*) which seemed to us to be a distinct improvement over any previous construction. Instead of putting columns at the corners of the shaft, two main columns are placed in the middle of the curbing at each end of the shaft just back of the guides, the guides themselves being carried directly by, or bracketed from these columns. The center guides are also carried by a vertical column directly between them, this column being hung from the main structure, so as not to rest on the buntings, and being bracketed at several points so as to have ample lateral and longitudinal stiffness. When adapted to an end hoist tower, the sheaves are carried directly on an A-frame of the same width as the column, the forward leg of which is carried down to the ground in a line outside of the resultant of the cable stress. All columns are made of such width as will insure sufficient lateral rigidity when unsupported throughout their length, and to carry the journal bearings of the sheaves. The main structure carrying the weighhouse and screens, is built over the tracks at right angles to the hoisting frame and designed to give the greatest possible rigidity to the tower and to carry the shock of dumping directly to the ground. This construction is shown in Figs. 1 and 2, which represent the steel tipple for the West Kentucky Coal Co., at Sturgis, Ky.

With this tower of extreme rigidity, it is an easy matter to design a screen structure so stiff that the vibration of the screens will have little or no effect upon it and the screens can then be hung on properly journaled, rigid hangers, so as to operate with only a fraction of the friction and wear incident to roller bearings. The eccentrics or other operating mechanism for the screens may then be supported on cross members, so that any vibration arising from them will be entirely absorbed before being communicated to the main structure.

The advantages of this construction are many. In the first place, the main tower is composed of three very heavy and substantial members which can be encased in concrete so as to protect them entirely against accident or corrosion. Second, the weight and cost of the main tower, in spite of its great strength and rigidity, are scarcely half that of a properly designed A-frame tower. Third, the shaft is left entirely clear at the bottom of the tower, so that the rails and other material can be easily loaded on the cages. Fourth, the foundations are cheapened and cut down in number and a screening structure of sufficient stiffness can be built and rigidly connected to the main structure. Fifth, the guides are attached directly to the tower columns and form a stiff rigid slide for the cages from shaft to dumping point; all at a less cost than the former style of construction.

In working out the details of this new type of structure it became necessary to make a careful analysis of the action and operation of the screens. The first requirement is to design the screens so that they will be as nearly balanced as possible under the varying conditions of load. This can usually be accomplished by making the upper section of the screen, which received the coal directly from the weighpan, somewhat shorter and lighter than the lower section. In studying the forces acting upon the screen through the driving rods, it became evident that it was possible to devise a much better operating mechanism than the time-honored eccentric. The eccentric, while a very convenient device, is inefficient and troublesome for transmitting power. The friction on the eccentric strap is great, causing frequent heating, and the diameter is so large that perfect lubrication becomes difficult. We substituted a bell-crank device, operated by driving rods from two large flywheels which perfectly balance the two sides of the screen. In this way the power factor is made so constant that the motor or engine can be directly connected to this shaft and as the whole mechanism is self contained, the resulting vibration is very small. The driving rods have brass journal bearings of ample size, arranged for thorough lubrication, and the ratio of lever arms is such that the forces are reduced to 25% before reaching the driving rods and the flywheels.

The next step was to adapt the "A & G" tipple construc-

*Patented July 16, 1912.

tion to a timber-lined shaft and this has proved to be unexpectedly easy. It is only necessary to carry the two main colums on law "A Frames," or even on steel beams, to any desired distance from the shaft curbing. Next comes the adaptation.

Modern Methods in the Manufacture of Portland Cement

By H. K. G. Bamber*

[The following description of some of the late developments in cement manufacture is a part of an address delivered by Mr. Bamber before the Vancouver branch of the Canadian Society of Civil Engineers, May 26, 1913. The plant which is taken as the example is a new one nearing completion at Bamberton, on Saanich Inlet, Vancouver Island.—Ed. Engineering News.]

The manufacture of portland cement has its origin in Great Britain, where suitable materials are found in the greatest abundance. The advancement of chemical science, however, has enabled materials of different characteristics found in various parts of the world to be brought into use, and the author himself has been engaged in British Columbia on the construction of a cement plant at Bamberton on the Saanich Inlet, Vancouver Island, for the Associated Cement Co., (Canada) Ltd., a company formed by the Associated Portland Cement Manufacturers (1900) Ltd., of England, to operate upon a practically pure limestone, and a clay shale of very uniform composition. Particular reference will be made to the special additional processes which have been introduced in the new plant on Saanich Inlet, in order to insure the absolute uniformity of quality, the absence of which in the product of many plants has been the cause of much anxiety and trouble to the constructional engineer.

There are many factors which help to produce various unsatisfactory results, but perhaps the feature of most importance in the experience of the engineer, and the one in which uniformity is most desirable, is that of setting time. The difficulties of the engineer are great, if during the construction of some important work he is suddenly confronted by a change in the characteristics of the materials he is using, to counteract which might necessitate a reconsideration of his methods of construction, and it should be the aim of all cement manufacturers to supply as uniform a material as possible; so regulating the various properties of their product to suit the climatic and other conditions existing, which latter have a most important bearing on the setting time of all cement, which as a chemical product is rapidly affected by changes in atmospheric conditions. The difficulties which confront the cement manufacturer, who having produced an article, the very first quality of which is subject to variation in many of its characteristics due to such atmospheric changes, is not fully realized, or understood, and it frequently happens when some difficulty arises in connection with construction, due to such causes, the quality of the cement is unjustly impugned. Long experience has taught the prudent manufacturer how to produce cement which is least affected by such changes, and the methods adopted will be shortly described.

The manufacture of portland cement necessitates three distinct and separate operations—the first process is mechanical, and includes the assembling, proportioning, amalgamating, and grinding the raw materials—the second chemical, during which the material prepared by the first process is calcined at a high temperature, bringing about chemical combination of the various ingredients—the third and final process being partly mechanical and partly chemical, in which the clinker resulting from the calcining operation, together with a small percentage of retarder, is reduced to a fine powder. During the latter operation the cement is submitted to a partial process of hydration by means of steam, at a temperature ranging between 220° and 300° F., and after subsequent cooling the cement is ready for immediate use.

PROCESS 1—It is essential that the raw materials selected are of such physical character as to be easy of reduction, and such chemical composition that the resulting mixture contains the necessary ingredients in proper ratio one to the other. If so constituted, and thus available for the purpose, the proportions of the mixture are kept constant by means of continuous chemical supervision, the permissible limits of variation in the composition of the raw mixture being very narrow.

This preliminary part of the manufacture may be conducted by one of three methods depending upon the physical condition of the raw material to be operated upon.

Where the materials are soft, as in the case of chalk, clay and marls, such as are found in England, the wet process is usually adopted, which consists of reducing the materials together to a pulp, or slurry, containing about 40% water. This is easily accomplished in open wash mills, or pug mills, requiring but small expenditure of power.

When one or both of the materials are of a hard or crystalline character, and in some cases with the soft materials already referred to, the dry process is adopted, which consists of evaporating the water from the raw materials as quarried, and grinding them in a dry state to a fine powder, by means of suitable machinery.

The third process, which is suitable for both soft and refractory materials, has been adopted for the works at Bamberton, Saanich Inlet, and consists of a semi-wet process, in which the drying of the raw materials is avoided—the materials being reduced to a thick slurry in mills suitable also for the dry process, but with a small percentage of water, producing a more uniform and reliable product than is possible with the dry process.

In any of the processes it is essential to reduce the raw material to such fineness that at least 95% will pass through a sieve having 32,400 openings per square inch, more particularly where the materials have not been partially mixed by nature.

A great improvement in the quality of the cement is produced by the introduction, at this stage of the manufacture, of such storage capacity and machinery that large quantities of this prepared slurry can be kept in reserve, and continuously mixed, thus correcting any irregularities that may have occurred in the composition of the material during the first mixing and grinding operations. By this means a product of absolutely correct and uniform composition is presented to the kiln for calcination, and it will be readily understood that, although the cement industry as a whole has not until recently thought it necessary to provide such intermediate storage of prepared raw material, how important it is, before the material is submitted to an expensive chemical process of calcination, in which the desired results are so adversely affected by any irregularity, either in the material, or the temperature at which the operation is conducted, that this correcting process should be installed. It is not possible to get perfect chemical combination of the lime with the silicates and aluminates of the clay or shale unless the materials have been reduced to a very fine state of subdivision, and have been thoroughly amalgamated.

PROCESS 2—The calcining or clinkering is carried out in rotary kilns, which with modern practice are increasing in size, now averaging from 150 to 200 ft. in length, and from 7 to 10 ft. in diameter, being set at an angle to the horizontal of ½ in. to the foot. The raw material is fed into the upper end of the revolving kiln, while the fuel for raising the temperature within the kiln is introduced at the lower end, the raw material passing successively through the three operations of drying, calcining, and clinkering, on its passage down the kiln, the clinker leaving the kiln at red heat. This heat is removed by passing it through rotary coolers, and is used for heating the air for combustion passing into the kiln.

The cool clinker is now ready for the final grinding operation, but before being submitted to this the clinker is stored and mixed under cover in large bulk, so that again any small irregularities of the calcining operations are spread over the product of several days, and thus tend toward uniformity of the finished product.

PROCESS 3—After cooling and mixing, the clinker, which is material of hard and refractory character, is reduced to a fine powder with the aid of very powerful crushing and grinding machinery, details of which will be explained with the aid of lantern slides. The importance of very fine grinding was not realized until recent years, but its value will be understood when it is known that it is only the impalpable powder of the cement which has any cementitious properties—the coarser particles present being of no more value than their equivalent bulk of sand or crushed rock. It is common practice at the present time to so reduce the clinker that 85% will pass through a sieve having 32,400 openings per square inch, but at the new works at Bamberton, machinery has been installed to enable the cement to be so ground that 95% will pass through this sieve if required. This extra fineness materially increases the cost of production, but adds considerably to the cementitious value of the material. Using this fine-ground cement a much richer and

*Cement Expert, Ingress House, Greenhithe, Kent, England.

stronger concrete is obtained, by reason of the larger quantity of cementitious material present in the very finely ground cement, or on the other hand economies in cost of construction can be obtained by reason of the larger amount of aggregate which such fine-ground cement will carry, to produce equal results.

During the process of grinding provision is made for the regulation of the setting time of the cement. Cement clinker ground without any such provision is always very quick setting. The method adopted at the Bamberton works is similar to that now almost universally employed in England, and consists of injecting steam into the tube mills during the final process of grinding together with the addition of a much reduced proportion of gypsum, which is used as a retarder. The effect of this process is to hydrate and thus remove the expansive properties of any loosely combined lime compounds which have resulted from any slight defects which have passed the earlier processes uncorrected, and thus produce a cement which is safe to use immediately after manufacture, even if taken hot from the mill, and by means of this process the setting time of cement can be regulated to suit all requirements.

The difficulty often experienced by engineers, however, in using hot cement is being provided against by the introduction, at the Bamberton works, of a separate cooling plant, through which all cement as it leaves the grinding mill is passed. This special plant extracts the heat from the cement, reducing it to atmospheric temperature before storage. This is a very important addition to the methods of modern manufacture, and, although used largely in English plants, is being introduced for the first time into Canada, or indeed on the American continent, at the plant now being installed. After the cement has been submitted to the process described, it is stored, and mixed in large bulk at atmospheric temperature, before being placed on the market.

The works at Bamberton are now just commencing manufacturing operations, and will be producing full output of 2000 bbl. per day before the end of June.

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Classification of Water Consumption in Milwaukee, Wis.*

The average daily consumption of water in Milwaukee, Wis., in 1912, was 47,556,000 gal. The maximum daily consumption has reached figures nearly twice that average.

The present supply comes from a brick-lined intake tunnel, 7½ ft. in diam., which extends to a crib 3146 ft. from the shore of Lake Michigan. From the crib two cast-iron pipes, each 60 in. in diam., extend 5000 ft. farther into the lake, where the depth of water over the intake is 60 ft. The capacity of the tunnel, with a drop of 4 ft. in the pump wells, is 75,000,000 gal. in 24 hours, and with a drop of 8 ft. in the pump wells, 95,000,000 gal. The practical limit of the present waterworks has, therefore, been reached and the construction of a new intake tunnel was recently begun. The new intake will consist of a 4000 ft. brick tunnel, 12 ft. in diameter, extending to a crib in 40 ft. of water. From the crib four lines of 72-in. cast-iron pipe will extend to a point 6000 ft. from shore in 60 ft. of water. The contract was let on Apr. 29, of this year.

*From the recent annual report of the Milwaukee Water Works.

In connection with the construction of the new works the city engineer has compiled some interesting statistics on the amount and character of the city's water consumption, which are given in the accompanying tables.

The metered water rate in Milwaukee is 4½c. per 100 cu.ft., or 6c. per 1000 gal., for water furnished within the city, and 6c. per 100 cu.ft., or 8c. per 1000 gal., for water furnished beyond the city limits. This rate applies to all consumers regardless of quantity consumed. There were 57,657 services metered on Jan. 1, 1913, and 700 services unmetered, but these were to have been metered by May 1, 1913.

The water department has found no flat-rate assessment plan which has proven fair and equitable and has decided in the future to meter the services of all consumers great and small. The department has found, by experience, as has been found everywhere else, that wilful waste ceases as soon as the consumer discovers that others no longer pay for his wastefulness.

Table I gives the classification of metered consumers for the year 1912. One hundred of the largest consumers paid $402,563, or nearly 50% of the entire revenue of the water department during 1912.

TABLE I. CLASSIFICATION OF WATER CONSUMERS
MILWAUKEE, WIS.

1,185	less than $0.50 per year	2.10%
6,347	between $0.50 and $1.00 per year	11.00%
15,182	between $1.00 and $2.00 per year	26.33%
10,656	between $2.00 and $3.00 per year	18.48%
7,157	between $3.00 and $4.00 per year	12.41%
4,899	between $4.00 and $5.00 per year	8.50%
8,017	between $5.00 and $10.00 per year	13.90%
2,228	between $10.00 and $20.00 per year	3.86%
598	between $20.00 and $30.00 per year	1.00%
271	between $30.00 and $40.00 per year	0.47%
167	between $40.00 and $50.00 per year	0.29%
376	between $50.00 and $100.00 per year	0.65%
428	between $100.00 and $ 500.00 per year	0.76%
66	between $500.00 and $1000.00 per year	0.11%
80	between $1000.00 and over	0.14%
57,657		100.00%

Table II gives the comparative statement of water consumption, pumped, metered and unaccounted for in 1912. The cost per 1000 gal. based on the total pumpage and ordinary expenditures was 1.6c., and based on the amount for which the city received revenue, 2.15c.; the actual cost per 1000 gal., including sinking fund charges, depreciation, taxes, and 4% interest on net invested capital was 5.773c. The revenue per 1000 gal. based on the total pumpage was 4.676c., and based on the 74.73% of the total for which the city actually received payment, was 6.257c. per 1000 gal.

The largest consumer on the water registrar's list is the Chicago, Milwaukee & St. Paul Ry. Co., whose shops are just outside the city limits. The water bill for these shops in one year amounted to $70,000. The shops employ 6000 men.

The per capita consumption in 1912 was 113.2 gal. per day, but eliminating the 100 largest consumers the daily per capita consumption was only 75 gal.

TABLE II. COMPARATIVE STATEMENT OF WATER CONSUMPTION—1912

1	2	3	4	5	6	7	8	9	10
	Minicipal: buildings, parks, sprinkling, fire extinguishing	Industrial: power and manufacturing	Commercial: dwellings and stores	Slippage of pumps	Under-registration of meters	"Unaccounted for"	Total gal.	Per cent.	Revenue per mil-gal.
Metered	432,460,200	6,270,402,130	4,734,356,770				11,437,219,100	65.71	
Estimated flat rate	1,145,703,526	63,896,250	360,664,000				1,570,263,776	9.02	
Under registration of meters					522,168,287		522,168,287	3.00	
Slippage of pumps				870,280,479			870,280,479	5.00	
"Unaccounted for"						3,005,677,938	3,005,677,938	17.27	
Total water consumption	1,578,163,726	6,334,298,380	5,095,020,770	870,280,479	522,168,287	3,005,677,938	17,405,609,580	100.00	$46.76
Per cent of total pumpage	9.06	36.40	29.27	5	3	17.27		100.00	
Daily consumption per capita, gal.	10.26	41.20	33.14	5.66	3.39	19.55	113.2		

George Blinn Francis

The sudden death of George B. Francis on the night of June 9, from a hemorrhage of the brain, was noted in our issue of June 12. For nearly a year past Mr. Francis had been in ill health so that he had been obliged to relinquish his professional work. His death, while still in the prime of life, will be felt as a severe loss by his many friends in the engineering profession.

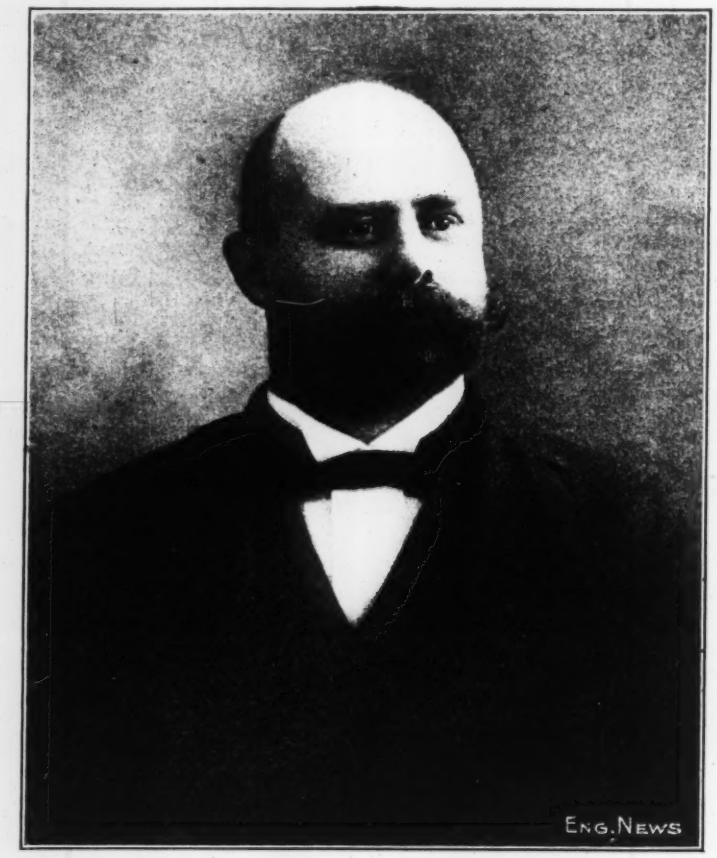
George Blinn Francis was born at West Hartford, Conn., Jan. 31, 1857. He was a lineal descendant of some of the very earliest settlers in the Connecticut Valley. After attending the public schools of his native town and the Hartford High School, from which he was graduated at the age of 17 years, he went to Providence, R. I., where he took a minor position in the engineering department of the Providence city water-works.

He remained there several years until in the early '80's, the construction of the West Shore R.R. opened a chance for employment to many young engineers who afterward won distinction in the profession.

During the railway construction boom of 1880 to 1887, Mr. Francis was one of the army of engineers who were roaming from the Atlantic to the Pacific wherever new railways were being surveyed and built. During this time he was connected successively with the West Shore R.R., the Oregon-Washington R.R. & Navigation Co., the Northern Pacific Terminal Co., in Oregon, the Eads Tehuantepec Ship Railway, of New York City, which was proposed by the late James B. Eads to transfer ships across the Isthmus of Tehuantepec in Mexico, the New York, Ontario & Western Ry., in New Jersey, the West Shore R.R., in New York, the Portland Construction Co., at Portland, Ore., the Northern Pacific Ry., in Washington, the South Pennsylvania R. R., in Pennsylvania, the New Jersey Junction Ry., in New Jersey, and the New York Central & Hudson River R.R., in New York. During the early part of this period, on Apr. 11, 1882, he was married to Miss Florence Louise Green, of Providence.

On May 1, 1887, he returned to his old home at Providence, where he had been appointed Principal Assistant Engineer of the New York, Providence & Boston R.R., now the Shore Line of the New York, New Haven & Hartford R.R. This position he resigned in 1892 to become Resident Engineer of the New York, Providence & Boston & Old Colony R.R. Terminal Co., having direct charge of the design and construction of the Providence railroad terminals. By his conspicuous success at Providence a larger field for his engineering talents was soon opened, and in 1896 he was appointed Resident Engineer and Acting Chief Engineer of the Boston Terminal Co. on the construction of the famous South Terminal passenger station in Boston, Mass., one of the first of the great passenger terminal stations in the United States. The Providence and Boston terminals are fitting monuments of Mr. Francis' engineering skill.

On the completion of the Boston terminal in 1900, Mr. Francis again returned to Providence, this time as Chief Engineer of the Providence street railway system. In June, 1902, he resigned this position and removed to New York City where he became the head of the civil engineering staff of Westinghouse, Church, Kerr & Co., and as such he had charge of much important work in connection with the Pennsylvania Terminal in New York City. He also served as Chief Engineer and Consulting Engineer on many other large projects undertaken by Westinghouse, Church, Kerr & Co., in Rhode Island, Massachusetts, New York, New Jersey, Pennsylvania, Virginia, Michigan, Missouri and Georgia. During the few years he had also done a great variety of work, as consulting engineer, especially in Providence, where his previous work was well known and appreciated.



Geo. B. Francis

It is natural that a man of so active a temperament should have availed himself of every opportunity to meet and know his brother members of the engineering profession, and thus we find him not only a member but a very active member of the American Society of Civil Engineers, the Canadian Society of Civil Engineers, the Institution of Civil Engineers of Great Britain and a Past-President of the Boston Society of Civil Engineers. The breadth and scope of his activities not only as a member of the American Society of Civil Engineers but as a practicing civil engineer may in a small measure be gained from a mere mention of the subjects of the papers and discussions which he contributed to the *Transactions* of that society: Bridge Substructure and Concrete Work; "Electric Railways in the Ohio Valley between Steubenville, Ohio, and Vanport, Penn."; Electrification of the Suburban Zone, New York Central & Hudson River R.R.; Overloaded Bridges; Panama Canal; Sinking Bridge Piers; Substructure of Marsh River Bridge; "The New York Tunnel Extension of the Pennsylvania R.R.; Certain Engineering Structures of the New York

Terminal Area"; "The Scranton Tunnel of the Lackawanna & Wyoming Valley R.R.", for which he received the Thomas Fitch Rowland Prize in 1906; "The South Terminal Station, Boston, Mass."; Uniform Practice in Pile-Driving.

Mr. Francis was also prominent in the Masonic Fraternity and was a Past-Master of his home lodge in Providence.

He is survived by a widow and one son, George B. Francis, Jr. The interment was at his birthplace in West Hartford, Conn.

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Federal Report on Carey Act Irrigation Projects

A third and final report on the "History and Present Condition of the Carey Act Projects" was made to the Secretary of the Interior on Feb. 15, 1913 (Senate Document 1097, 62d Congress, 3d Session) by a committee created during the previous year. The committee consisted of F. R. Dudley, of the General Land Office; F. W. Hanna, of the Reclamation Service; and Herman Stabler, of the Geological Survey. The report consists of a general introduction, a review of operations under the Act by states and a general summary and conclusions. The latter is here reprinted, as follows:

The extent of Carey Act operations in the various states, and the technical reclamation of lands as evidenced by the granting of patents, is shown by the following table, taken from the report of the Commissioner of the General Land Office for 1912:

The table shows the Carey Act has been productive of irrigation progress in that nearly 474,000 acres of land have had waer supplies made available to them. Of this area over 62% is in Idaho, over 22% in Wyoming, nearly 11% in Oregon, and the remainder, a little over 5%, in Montana In the other states practically no reclamation has so far resulted. In addition to the reclaimed lands for which patent has issued there are over 200,000 acres of lands included in pending applications for patent. No information is available to show what proportion of the land technically reclaimed has actually been irrigated. If, however, it be assumed that at the date of the report from which the above table was taken water was available for 680,000 acres of Carey Act lands, and that 50% of these were actually irrigated, it would follow that the total area irrigated under the Carey Act in 1912 was about 340,000 acres.

It is well known that the Carey Act projects include large areas of private lands as well as segregated lands. No detailed information as to the areas of such private lands is available, but it seems likely from fragmentary data that the Carey Act projects as a whole have made water available for an area of 1,200,000 acres, of which possibly 600,000 acres were irrigated. These estimates are, of course, of doubtful accuracy. It seems fairly certain, however, that water has been made available for about 20 per cent. of all the lands that have been segregated to the several states, and thousands of acres of additional lands are being brought under water every year. With all the undesirable features of its history, therefore, it must be concluded that much actual development has been accomplished. That more actual reclamation has not been accomplished and that severe and well merited criticism of operations under the act has arisen is due chiefly to the following causes:

(a) The inactivity during the early stages of the act, due largely to a lack of appreciation of its possibilities on the part of the states and to a lack of interest on the part of capital, as a result of loss experienced by promoters of private irrigation projects.

(b) The segregation of land for long periods of time at the requests of promoters, either without funds for financing the project or without intention to invest their own funds in the undertakings, resulting in long delays without accomplishing results.

(c) The underestimation of costs of irrigation works, resulting in bankruptcy of the construction companies or long delays in getting additional funds for completing the developments.

(d) Careless and inefficient state supervision of Carey Act matter in general and in particular of the construction of the irrigation works, resulting in nonacceptance of the works and in legal proceedings.

(e) Prior to establishing the practice of Federal investigation of the water-supply for the segregation before approving the segregation, the segregation of lands with inadequate and incompetent knowledge of the water-supply for them resulting in insufficient water-supply for properly irrigating the land.

(f) Improper methods of disposing of the lands under the segregations, permitting them to pass into the hands of local and nonresident speculators, who either have unloaded their holdings onto the actual farmers with heavy burdens, or who are renting their holdings to such farmers, or who are keeping their lands out of cultivation.

(g) Failure to appreciate the long time required to settle and develop the arid lands and reduce them to a profitably productive state and to adjust payments of water rights thereto.

(h) Failure to appreciate distances to produce markets and the time required to develop local markets and local stock consumption of crops.

(i) Dishonesty of state officials in the administration of Carey Act matters in collusion with dishonest construction work by the contractor on projects under development.

(j) Application for segregation of large areas of land when irrigation securities could be readily sold, accompanied by failure to finance the projects promptly, subsequent financing being made difficult or impossible by unfavorable market conditions for such securities.

The chief obstacle in the way of Carey Act projects at present is a general lack of confidence on account of past failures, resulting in inability to secure financial backing. When a market for Carey Act bonds is found, it is generally at a price to the developing company of 80 to 85, thus making the cost of money to the company at the rate of 7% or more on the basis of a 6%, and in addition requiring the redemption payment for the bond to be from 20 to 25% greater than the original proceeds. The cost of colonization, which is a surprisingly large item in undertakings of this character; the cost of administration during a period of 20 years more or less, from the beginning of construction until the last deferred payments have been made by settlers; the cost for interest for the period of investigation and construction and until the interest on settlers' notes is sufficient to offset the bond interest; and a profit, even though small, for the developing company and the people who have taken the risks of the development increase the cost of the land to the settler, under even the best projects of this character, to an amount in the neighborhood of twice the actual construction cost.

It is evidently not possible under any scheme of financing and development to remove all of these items of cost from irrigated land. Under the Government projects of the Reclamation Service the items of interest and profit have been eliminated, but the costs of colonization and administration remain, in addition to the actual cost of construction. It has been suggested that the same items could be reduced under the Carey Act by the states lending their credit to the projects and supervising their development in such manner as to assure successful development under reasonable conditions.

OPERATIONS UNDER THE CAREY ACT, BY STATES

(State desert-land segregation under section 4 of the act of Aug. 18, 1894 28 Stat., 372-422), and the acts amendatory thereof, commonly known as the Carey Act, with the action taken thereon from the passage of the act to June 30, 1912.)

State	Applied for	Segregated	Rejected or relinquished	Patented	Reconveyed	Time to reclaim extended
	Acres	Acres	Acres	Acres	Acres	Acres
Colorado	373,593.56	272,197.98	46,221.77	.....	.....	.....
Idaho	3,106,994.17	1,299,541.63	877,609.93	295,995.68	.....	51,178.46
Montana	554,432.63	200,597.06	373,206.74	25,653.03	10,104.03	62,604.95
Nevada	163,789.05	36,808.59	47,229.35	.....	.....	.....
New Mexico	10,164.68	7,564.68	2,600.00	.....	.....	.....
Oregon	736,163.60	338,617.19	229,647.12	51,583.13	6,014.49	.....
Utah	435,170.02	136,820.63	267,980.83	.....	.....	.....
Washington	155,649.39	.....	155,649.39	.....	.....	.....
Wyoming	1,765,079.48	999,083.61	300,400.66	100,767.67	3,977.23	17,397.53
Total	7,301,036.58	3,291,231.37	2,300,545.79	473,999.51	20,095.75	131,180.94

FIELD AND OFFICE

A Special Problem in Reverse Curves

By Wm. C. Crosby*

An interesting problem in reverse curves presented itself recently for solution and various handbooks on railroad curve problems were duly consulted in order to find some ready formula applicable to the case in hand; but to no purpose. It became necessary to "get into" the problem, with the resulting consequence of making a discovery useful in its application to the solution of the problem at hand as well as important in its general adaptability to all reverse-curve problems.

The Problem—Referring to Fig. 1, the points A and B were fixed points on the tangents, and the reverse

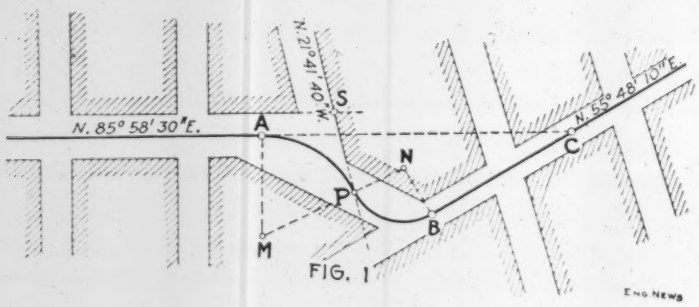
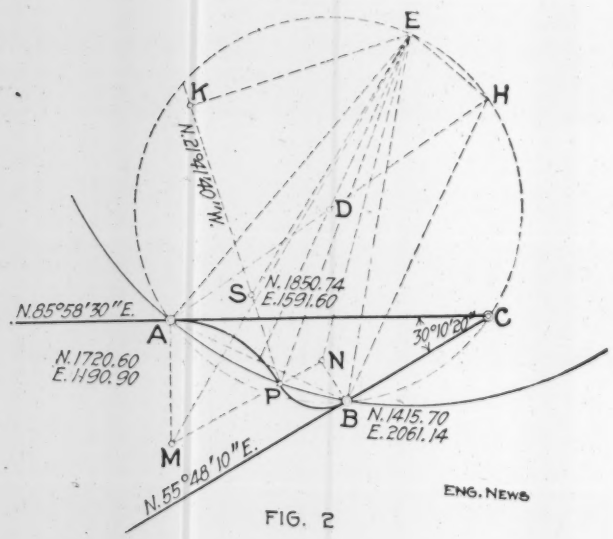


Fig. 1. Special Reverse-Curve Problem: Tangent Points A and B Fixed, and Reverse Curvature to Occur on Line S P



curves AP and PB were to connect the tangents, but with the specific condition that the point P of reverse curvature must lie on the prolongation of the street line SP as shown.

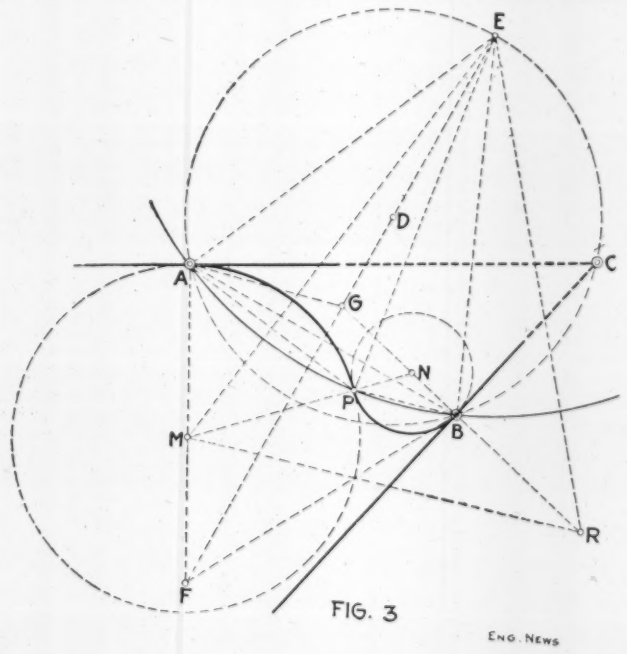
Since it was not permitted to disturb the position of either A or B and since the true position of P was not known excepting that it was a point somewhere on a fixed line, it became necessary to determine the locus of all the various points of reverse curvature for any pair of conjugate reversing arcs tangent at A and B, and within the limits of the fixed tangents. Having determined this locus, its intersection with the fixed line SP determines the true position of P, after which the radii MP, NP could then be computed as well as any other matter which might be necessary.

Fig. 2 is a skeleton sketch of the conditions presented in the given problem, having the corresponding points marked the same as in Fig. 1. The dotted auxiliary lines used in the computation are also shown.

Solution—The arc APB shown in a solid line is the locus of all points of reverse curvature possible between A and B and is obtained thus:

Draw a circle passing through the three given points A, B and C; the center of this circle is D. Join A with B, which is a chord in the circle just drawn. Through the center D, draw a diameter perpendicular to the chord AB and cutting the circumference at E: then E is the center of a circular arc through A and B, which arc is the desired locus. Its intersection P with the given line SP is the point of reverse curvature sought in the specific problem.

The required values can be calculated on the basis of the geometrical construction. Choosing one of the two tangent points A or B as an origin and arbitrarily as-



signing a bearing to the tangent will often facilitate the computation, for by so doing and deriving coördinates for the different points much purely trigonometrical work as well as the study of the geometrical interdependence of the given points and those to be found will be avoided.

This last remark may appear superfluous to the technical man; but it carries with it a hint for the benefit of those who have had but little practice, or lack in training, and are sometimes obliged to perform calculations which frequently cause them no little annoyance and waste of valuable time.

Demonstration—In order to prove that the geometric

*Assistant Engineer, Department of Docks and Ferries, New York City.

construction of the circular arc APB, whose center is E, as shown in Fig. 2, makes this arc the locus for all points of reverse curvature to any pair of circular conjugate arcs tangent to each other and to the given tangents at the fixed points, refer to Fig. 3 and proceed as follows:

The centers of two conjugate circles tangent to the given tangents at A and B are denoted by M and N. Prolong NB to R, making $BR = PM$; then triangle MNR is isosceles, having $MN = RN$. Since A and B are points on the same circumference $AECB$, therefore $\angle EAC = \angle EBC$, each being measured by half the arc EC; adding to each of these equal angles the equal angles MAC and RBC (right angles) makes $\angle MAE = \angle RBE$; therefore, $\triangle MAE = \triangle RBE$, having the sides EA, AM and the included angle MAE of the one, respectively equal to the sides EB, BR and the included angle RBE of the other. Hence $ME = RE$, and triangle MER is isosceles, with $\angle EMR = \angle ERM$. Taking away from each of these equal angles the equal angles NMR and NRM leaves $\angle EMP = \angle ERB$. But $\angle ERB = \angle EMA$; therefore, $\angle EMP = \angle EMA$.

Now in the triangles MAE, MPE, the side ME is common, $MA = MP$ and $\angle EMA = \angle EMP$; hence, these triangles are equal; therefore, $PE = AE = BE$. Hence the point P is on the arc of the locus circle which passes through A and B. But P, by construction, is the point of reverse curve of the conjugate arcs AP, PB, and is a point on the line MN joining the centers of these arcs; therefore, the point of reverse curve is at the intersection of MN with the locus circle passing through A and B and whose center is E.

For any other position of M, P and N a similar demonstration will show that P must lie at the intersection of MN with the same arc APB. Hence APB is the required locus, which was to be proved.

Remarks—As P approaches B for a limit, the radius MA increases while the radius NB decreases, and the chord AP approaches the chord AB for a limit. The limiting maximum value for the radius MA will be FA, while the radius NB of the conjugate arc will be zero. Conversely, as P approaches A for a limit, the limiting maximum value for the radius NB will be GB, while the radius MA of the conjugate arc becomes zero. These limiting maximum values in all cases may be at once determined, as at G and F, by drawing BG and AF perpendicular to BC and AC respectively and intersecting both by a diameter through D perpendicular to AB as shown.

If, as often happens, the tangents are parallel to each other, then the point of intersection C will be infinitely removed from A and B, and likewise the radius EA will be infinite in length; the locus then becomes equivalent to the chord AB.

Application—The foregoing method will enable one radius to be readily obtained when the other is given; the position of the point of reverse curve can also be determined. Or, it is possible to obtain both radii, having given the special case where the point of reverse curve must lie somewhere on a fixed line passing between the given tangent points, as happens in the problem presented and illustrated by Fig. 1.

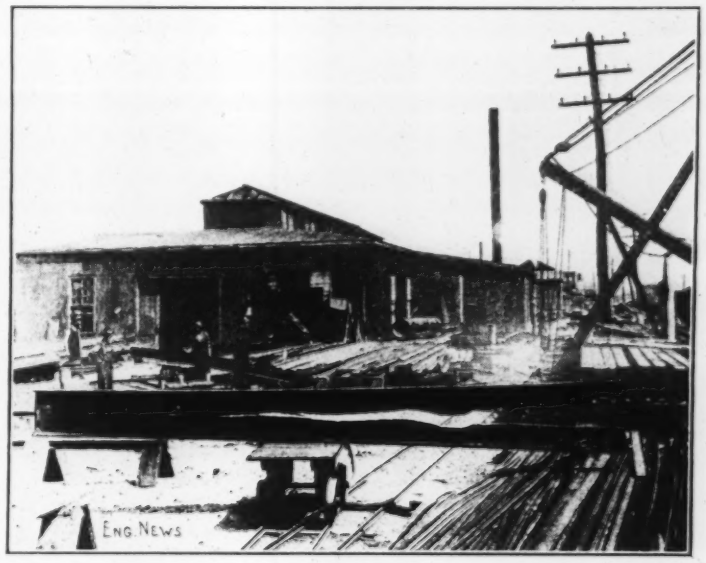
Note—The point E must always be taken on the same side of the chord AB with C. It is possible, where ACB is obtuse, for D and E to lie on opposite sides of AB; then with $AC = CB$, E and C would coincide.

In concluding, it may be remarked that the conditions given in the problem worked out, present a case of the most complicated kind, and the necessity for determining the locus is apparent. All problems involving reverse curves, however, are readily worked out by using the locus, particularly those in which the radii of the reverse arcs are unequal and where the tangents are not parallel. In the graphical investigation of a tentative study wherein certain conditions are to prevail, the plotting of the locus or of several loci will often save a great amount of time and trial calculation.

A Cracked I-Beam

The subjoined view of an 18-in. I-beam shows a bad case of brittleness and internal stress. The beam was in a commercial lot of bridge steel, and was not handled with unusual violence. The circumstances are set forth in the following letter:

This beam had been ordered from one of the mills to be used as a floorbeam in a highway bridge. It was taken into the shop one cold winter morning (about 10° below zero) and placed on skids resting on the flange in the same position as shown in the picture. There was some ice on the flange, at the right-hand end in the picture, and one of the men took a sledgehammer and struck it on the top flange near the end to break off the ice. The result can be seen in the picture. The crack started at the end, about the middle of the web depth, and continued to within a foot of the other end, where it stopped. The crack spread at the end where it started to about 10 in.



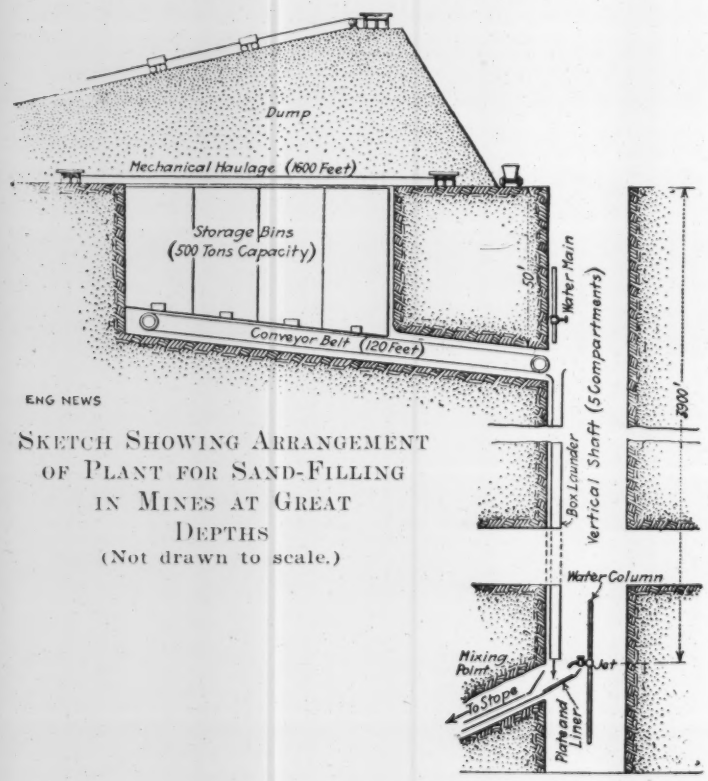
The mill took the beam back and replaced it with another. The incident happened two or three years ago, but I would be interested in getting a satisfactory explanation of the cracking.

Cases of cracking of rolled shapes, under circumstances indicating brittle material and internal stresses, have occurred before, though they are rather infrequent. We are not acquainted with any study of structural steel to get at the causes of such behavior. Ingot defects—blowholes, unsoundness, segregation of hardening impurities—affect structural steel in somewhat the same way as rail steel. In rolling, the flow of the metal under the rolls tends to set up internal stresses of various kinds, and the result will depend on temperature of rolling, degree of reduction in the final passes, etc. Much more information on the subject than is now available would be of interest to engineers.

A System of Sand-Filling for Deep Mine Shafts

A method of supplying dry sand to a shaft for filling purposes has been devised by Mr. Girdler-Brown, General Manager of the Cinderella Consolidated Mine, in the Transvaal, South Africa, and is described in a paper read at a meeting of the Institution of Mining and Metallurgy, London, England, Oct. 17, 1912, by R. E. Sawyer, under whose direction the plant was installed and successfully operated. An abstract of Mr. Sawyer's paper is as follows:

The method described renders the operation of sand filling at great depths, where, of course, it is most needed, a matter of comparative simplicity. In first cost it compares favorably with any other method, no de-watering cones or neutralization process being necessary, and it shows to the greatest advantage when employed in shafts of great depth and in circumstances where continuous filling is not necessary, as interruptions are almost certain to occur from time to time in wet weather, due to an excess of moisture in the sand.



SKETCH SHOWING ARRANGEMENT OF PLANT FOR SAND-FILLING IN MINES AT GREAT DEPTHS
(Not drawn to scale.)

The sand used should not contain more than from 5% to 6% of moisture, and should have been exposed to the sun and air for at least two days before use; it will then be practically free from cyanide and neutral in character. Sand in this condition may be found at the foot of any working dump during fairly dry weather. Sand taken direct from the cyanide tanks was tried, but even after it had been treated with potassium permanganate, considerable quantities of cyanogen were evolved when the sand became mixed with ordinary acid mine water. This action was, however, entirely obviated by exposing the sand to the sun and air, as already mentioned.

The plant was originally laid out with a view to adopting the usual practice in sand filling of running the sand down the shaft already mixed with water, but this idea was found to be impracticable, owing to the excessive wear of the pipes caused by the great depth through which the mixed sand fell, and the cost of pumping entailed.

When the column first installed was worn out, it was decided to replace this by a square wooden box conduit down which the sand should fall unmixed with water. This conduit measured 12x11 in. in cross-section, inside measurement, and its cost was approximately 60c. per running foot. Observation doors were cut at distances of about 100 ft.

The piping and conduit from the surface bins were replaced by a belt which conveyed the sand to the top of the box conduit. It was found that sand containing no more than 4% of moisture would run freely from the bins to the belt without handling. On arriving at the head of the box conduit, the sand falls down the box on to a steeply inclined iron plate on which a stream of water is made to play. The plate, by the way, should be provided with a liner of the hardest white cast iron to counteract the excessive wear at that point.

On being mixed, the sand and water flow into a steeply inclined conduit where they undergo further mixture before being conveyed by means of pipes or other conduits to the part of the mine requiring filling. The effective capacity of the plant is controlled by the quantity of water available, as it is found that the delivery of the sand through the vertical box is practically without limit.

From time to time trouble was caused by the sand containing too great a percentage of moisture. This caused it to adhere to the sides of the conduit in gradually increasing quantities until at last the flow was seriously impeded. Under such circumstances, the remedy was to sluice out the box with water from the surface until the adhering sand was washed away.

In this connection, experiments were conducted with a view to determining the maximum percentage of moisture which would allow of the sand being run down "dry." The following were the results obtained:

From 0 to 5% of moisture allowed the sand to fall freely, leaving the sides of the box clear and dry.

From 5 to 7% of moisture did not affect the fall, provided that the sides of the box were themselves dry.

From 7 to 9% of moisture caused the sand gradually to begin adhering to the sides of the conduit, where it accumulated slowly.

From 9% upward of moisture caused a rapid accumulation of sand along the sides of the conduit.

These results were largely influenced, it was found, by the proportion of slime contained in the sand.

The liability of the sand to choke the conduit under certain atmospheric conditions renders it essential to have an efficient bell-signaling service between the mining point and the surface bins, as the supply of sand should be regulated in proportion to the quantity of water available for service. Thus, if the sand is supplied too quickly, it has a tendency to pile up at the bottom of the box conduit and choke it, as the water is not in that case sufficient to sluice it away. On the other hand, if the sand appears to be coming down slowly, it may be that a certain proportion is sticking to the sides of the conduit, on account of there being too great a percentage of moisture. When this is found to be the case, sluicing must be resorted to as mentioned previously, and must be repeated from time to time as the occasion warrants.

Jets of compressed air were introduced with a view to increasing the velocity of the falling stream, and thus preventing the adhesion of the sand. The box conduit was furthermore connected with the intake of a ventilating fan near the bottom, and to a blower at the top, the idea being to dry the sides of the box, and thus prevent the sand from sticking. These devices undoubtedly permitted the use of damper sand than could otherwise have been employed, but they were practically of no avail when the sand contained more than 10% of moisture, and were consequently abandoned after prolonged trials.

There is actually a saving in the quantity of water requiring to be pumped out of the mine when the sand-filling plant is in operation. The sand in the stope probably retains at least 10% of moisture. The sand as sent down contains on an average 3%, and it is calculated that in the course of a good day's run, the water saved from the necessity of being pumped 4000 ft. to the surface will amount to something like 8000 gal.

The labor required to operate the plant is small. A learner in charge of three boys will look after the belt and surface bins, and the underground part, including the mixing point and the stope to be filled, is in charge of a timberman. The sand is brought from the dump to the surface bins by means of mechanical haulage, the actual shoveling and tipping necessary being done by unskilled labor. Taking an average of 400 tons per shift, the cost was 5.2c. per ton.

Five Blast-Furnace Blowing Engines, each with a capacity of 20,000 cu.ft. of free air per minute, operated by gas engines using blast-furnace gas, are to be built for the Maryland Steel Co. by the Bethlehem Steel Co., of South Bethlehem, Penn. The engines have double-acting gas cylinders in line with the blowing cylinders and are similar in type to those now in operation in the Bethlehem Steel Co.'s own plant. The gas engines have cast-steel cylinders, which are said to be larger than those of any gas engines ever built in this country.

THE GILMORE AND PITTSBURGH RAILROAD COMPANY, LTD.

Estimate of Cost of ..... Extension ..... To ..... Section .....
Office of Engineer ..... Armstead, Montana ..... 191 ..... Estimate No. .....

		Unit	Quantity	Price	Cost when completed: Subtotal	Cost when completed: Total	Remarks
1.	Engineering—5% of items 2–31 inclusive						
2.	Right-of-way and station grounds	Acre					
3.	Real estate	Acre					
4.	Grading						
a.	Clearing	Acre					
b.	Grubbing	Square rod					
c.	Common excavation	Cu.yd.					
d.	Loose-rock excavation	Cu.yd.					
e.	Solid-rock excavation	Cu.yd.					
f.	Overhaul beyond ..... feet	Cu.yd.					
g.	Piles	Lin.ft.					
h.	Timber in bulkheads, cribs, etc	M ft. b.m.					
j.	Riprap	Cu.yd.					
k.	Concrete masonry	Cu.yd.					
l.							
m.							
n.							
5.	Tunnels						
a.	Excavation	Cu.yd.					
b.	Masonry lining	Cu.yd.					
c.	Timber lining	M ft. b.m.					
d.							
6.	Bridges, trestles and culverts						
a.	Piles	Lin.ft.					
b.	Timber in frame trestles and decks of pile trestles	M ft. b.m.					
c.	Foundation excavation	Cu.yd.					
d.	Concrete masonry	Cu.yd.					
e.	Bridge steel	Lb.					
f.	Steel guard rails including splice bars, spikes, etc	Ton (2240 lb.)					
g.	Cast-iron pipe	Lb.					
h.	Timber in culverts	M ft. b.m.					
i.							
k.							
7.	Ties						
a.	Cross ties—1st class	Each					
b.	Cross ties—2d class	Each					
c.	Bridge ties	Each					
d.	Switch ties	M ft. b.m.					
8.	Rails, lb. per yd.	Ton (2240 lb.)					
9.	Frogs and switches						
a.	No. .. turnouts	Each					
b.	No. .. turnouts	Each					
c.	No. .. turnouts	Each					
d.							
e.							
10.	Track fastenings						
a.	Spikes—300 in 200-lb. keg	Lb.					
b.	Tie plates	Each					
c.	Splice bars (centered) and bolts	Pair					
d.	Nut locks	Lb.					
e.	Rail braces	Each					
f.	Guard rails on curves and in tunnels	Ton (2240 lb.)					
g.	Bumping posts	Each					
h.							
j.							
k.							
11.	Ballast	Cu.yd.					
12.	Track laying and surfacing	Mile					
13.	Roadway tools						
14.	Fencing right-of-way						
a.	Wire fence, feet panels	Rod					
b.	Cattle guards	Each					
c.							
d.							
15.	Crossings and signs						
a.	Excavation	Cu.yd.					
b.	Timber in grade crossings	M ft. b.m.					
c.	Foundation excavation	Cu.yd.					
d.	Masonry in overhead bridges	Cu.yd.					
e.	Timber in overhead bridges	M ft. b.m.					
f.	Steel in overhead bridges	Lb.					
g.	Track signs	Each					
h.	Crossing gates	Each					
j.							
17.	Telegraph and telephone lines						
18.	Station buildings and fixtures						
a.	Type, complete with fixtures	Each					
b.	Type, complete with fixtures	Each					
c.	Type, complete with fixtures	Each					
d.	Car-body type	Each					
19.	General office buildings and fixtures						
20.	Shops, engine houses and turntables						
a.	Shops	Each					
b.	Engine houses, stalls	Each					
c.	Turntables, length	Each					
d.							
21.	Shop machinery and tools						
22.	Water stations						
a.		Each					
b.		Each					
23.	Fuel stations						
a.		Each					
b.		Each					
31.	Miscellaneous structures						
a.							
b.							
c.							
32.	Transportation of men and material						
33.	Rent of equipment						
34.	Repairs of equipment						
35.	Earnings and operating expenses during construction						
35½.	Injuries to persons						
43.	Law expenses						
44.	Stationery and printing						
45.	Insurance						
46.	Taxes						
47.	Interest and commissions						
48.	Other expenditures						
	10% added for unforseen contingencies						
	Total						

Compiled by ..... Checked by ..... Approved by ..... Engineer

An Estimate of Cost Form for Railroad Construction

By C. O. Diffenderfer*

Construction work on the Gilmore & Pittsburgh R.R., between Armstead, Mont., and Salmon and Gilmore, Idaho, 120 miles, was started in the spring of 1909 and finished in the fall of 1910; and the accounting department began their accounts in conformance with the Interstate Commerce Commission's instructions embodied in their pamphlet entitled "Classification of Expenditures for Road and Equipment as Prescribed by the Interstate Commerce Commission in accordance with Section 20 of the Act to Regulate Commerce," effective July 1, 1907, and a supplement effective July 1, 1908.

The engineering departments made out the preliminary estimate of the cost in the usual manner by collecting all materials of a kind under one head, and when the work was completed there was considerable clerical work done in transferring items in order to compare the preliminary estimate of cost and the actual cost when completed, as shown on the auditor's books.

Last spring an estimate of cost form was devised which would aid in comparing the engineering department's preliminary estimate of cost and accounting department's record of cost of any extension when completed, and also, when the figures of the actual cost of the work were inserted in their respective places, would form a record for future reference in the engineer's office.

The general scheme of the accounts is as follows: (1) Road, items 1-36; (2) Equipment, items 37-42; (3) General Expenditures, items 43-48.

The following items have been omitted, however, either as being outside the pale of the construction department or as not being used in the construction of the Gilmore & Pittsburgh R.R.: (16) Interlocking and Other Signal Apparatus; (24) Grain Elevators; (25) Storage Warehouses; (26) Dock and Wharf Property; (27) Electric-Light Plants; (28) Electric Power Plants: (29) Electric Power Transmission; (30) Gas Producing Plants; (36) Cost of Road Purchased; and all the Equipment items, 37 to 42.

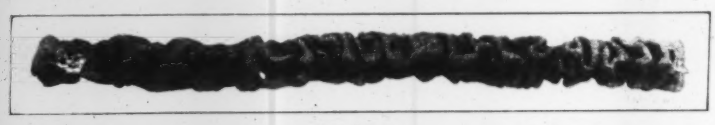
The locating engineer supplies all data from items 4 to 15 and the remainder are supplied in the chief engineer's office.

An additional value is in compiling the prospective cost in a uniform manner, and reducing oversights and omissions to a minimum.

*Engineer, Gilmore & Pittsburgh R.R., Armstead, Mont.

A Remarkable Upsetting Job on a Length of Steel Well Casing

The National Tube Co. reports that a customer sent them a description and the photograph here reproduced of a joint of $5\frac{3}{16}$-in. steel casing. The photograph repro-



NOT A WOOD BORER

duced herewith is neither a view of a diseased large intestine nor a picture of the Teredo Navalis. It is a piece of steel well casing which has been subjected to end compression by a nitroglycerin explosion and thus upset to less than half its original length.

According to information furnished by the National Tube Co., one of its customers sent on this exhibit to show the remarkable ductility of steel pipe.

The length of well casing formed part of a liner which was placed in a 3000-ft. well near Gore, Ohio. Although the well had been completed and shot it was decided to repeat the shot and to that end 150 quarts of nitroglycerin were lowered. The liner was then removed but upon inspection it was discovered that one joint was still in the hole. The shot was then fired with the hope that it would incidentally throw out the joint, but the latter lodged 1500 ft. from the top and it was several days before a belt socket could be put over it and the joint thus brought to the surface. The joint, which was originally 18 ft. in length, was compressed to about 8 ft. The photograph suggests the severe stresses to which the material was subjected, and also its remarkable toughness.

Reinforcing an Old Railway Viaduct*

By W. T. Curtis†

In 1888, the Chicago & West Michigan Ry. (since absorbed by the Pere Marquette R.R.) built a wrought-iron single-track viaduct across the Manistee River, about 100 miles north of Grand Rapids, Mich. This viaduct is 1170 ft. long, consisting in the main of 14 tower spans 75 ft. high and 30 ft. long, 45-ft. intermediate spans, and one 150-ft. river span. The 30-ft. and 45-ft. spans were simple deck-plate girders 8 ft. apart. The river span consisted of deck trusses spaced 14 ft.

The original structure was designed for a loading about equal to Cooper's E-25. The rolling equipment became heavier, and in later years the bridge was somewhat overloaded. In 1911 it was decided to adopt still heavier loading (E-50), and it was necessary either to replace the structure with a new one, or to reinforce it. The latter method was elected as being the more economical.

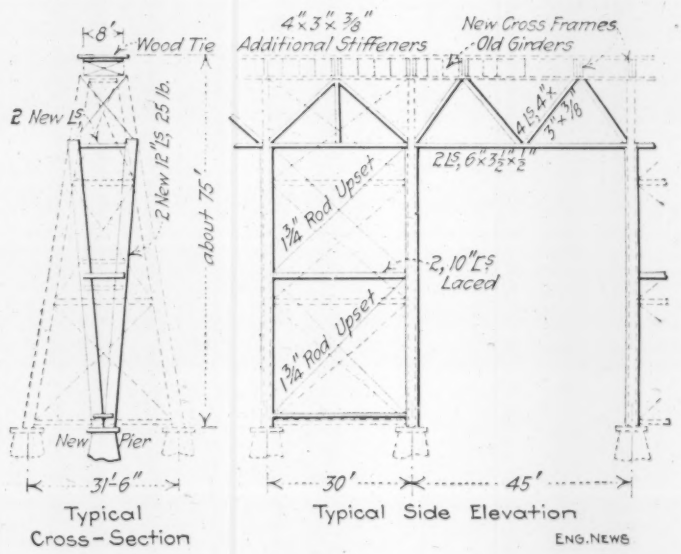
Mr. Deimling, Chief Engineer of the Pere Marquette R.R., asked for competitive propositions for both cost and design on the reinforcement, submitting (by way of suggestion) a solution which had been used some years ago on the Mill Creek trestle. This consisted in adding a new line of deck-plate girders on the center line of track, these girders being supported on new independent posts at the center of each bent.

Some tenders were offered on this scheme of reinforcement, but were discarded, partly on account of greater cost but chiefly on account of uncertainty of distribution of load among the three girders. The 8 ft. spacing of the old girders made the wood ties so short and stiff as to cause a marked degree of undeterminates of the distribution of the load among three girders. A further objection was the rocking or tipping effect over the new center girder as a fulcrum under imperfectly adjusted or worn ties, the shortness of the ties magnifying this difficulty. Still another objection was the fact that the erection would seriously interfere with traffic during a long period of time.

Another scheme considered was to reinforce each of the legs of the bents by adding another member parallel to it, surmounted with an additional new track girder placed closely along the side of the old girders, making a total of four girders. This was discarded as being prohibitively expensive and somewhat unsightly.

The scheme finally adopted was proposed by the Wisconsin Bridge & Iron Co., being original with the writer, and is shown in the accompanying cut, in which the dotted lines show the old or original structure and the full lines show the new members. This plan was adopted for its economy, its lesser degree of indefiniteness of distribution of loads, its far greater general stiffness, its minimum interference with traffic during construction, and incidentally on account of its having a less patched-up appearance than either of the other schemes.

The governing or fundamental idea of the adopted scheme was to convert the old deck-plate girders into deep lattice trusses, of which the old girders would constitute the top chords. This was done by adding a bottom chord about 12 ft. below the girders and introducing a Warren web system between the two chords thus formed. The old deck girders are stiff enough to resist the bending action of the load,



REINFORCEMENT OF AN OLD VIADUCT ON THE PERE MARQUETTE R.R.

(The dotted lines show the old structure, and the full lines show the reinforcement and reconstruction.)

and to deliver these local loads to the panel points of the newly formed truss. In calculation, for safety, the old girders were figured both as single spans between new panel points, and as continuous girders, the worst result being used in all cases. Additional stiffeners were added and cross frames installed.

To carry the excess load from these trusses to the ground, two new columns are added to each bent, starting at the bottom chord of the new trusses and running on an incline down to a new concrete pier built at the center of each old bent. The two new columns thus form a V and make the remodeled bent consist of two A-frames, as shown in the typical cross-section.

This construction has the desired effect of virtually lessening the height of the trestle towers by about 12 ft., for the load is now delivered into the towers at the bottom chord of the newly formed trusses. Furthermore, this system braces the structure longitudinally by virtue of the depth of the new trusses, while the new A-frame form of the bents stiffens the structure transversely. The scheme has the further advantage of being capable of field construction with practically no interference with traffic, as the old girders were not disturbed, except for the drilling of holes, etc., in them. In this manner we preserved for the main length of the viaduct the original two-point bearing for the ties.

At the river span, a new deck truss 150 ft. long was placed midway between the old trusses. The distance between the old trusses is 14 ft., being thus sufficient to give longer and consequently more limber ties, permitting of more definite proportioning of loads as delivered from the

*Abstract of a paper read before the Western Society of Engineers, at Chicago, June 9.

†Contracting Engineer, Wisconsin Bridge & Iron Works, Detroit, Mich.

ties into the two old and the one new truss, and also minimizing the tipping effect of the ties. The load from the new center truss is carried to the ground by a new independent vertical column at each end bent.

The towers supporting the river span, and the three short spans of the north approach to the river span, were originally built with the deck girders spaced 14 ft., as in the river span trusses, and we therefore reinforced this small portion of the viaduct by the introduction of a new girder midway between the two old ones, in line with the new river truss and, like the latter, supported by a single new independent straight column at the middle of each of the old bents.

A difficulty which presented itself was the difference in deflection between the old shallow river trusses and the new deeper one. This difference was found to be so small that it could be taken care of by making the hangers from the old to the new trusses heavier than was theoretically required. This made the hangers act as equalizers, so that if one truss should commence to be overstrained it would deflect enough more to deliver the load to the other truss before any actual harm would be done to the former. In this way, the load in any possibly overstrained member would still be so much below the elastic limit load that set deformation was out of the question.

It was found that the percentage of overstrain necessary to demand equalization was very low, and that while perhaps this solution of the distribution of the loads would not be considered as desirable in new designing, it served as a safe and satisfactory solution of the problem. The expansion of this new river truss was taken care of by a link construction.

The structure being narrow and high, the matter of thoroughly bracing it was nearly as important as the direct loading feature, and while the general form of reinforcement provided for a marked general stiffening of the main run of the viaduct, additional bracing was added entirely independent of the old bracing system, which was allowed to remain intact

Much trouble was experienced in finding suitable connections of the new wind-bracing rods to the old bents which were not converted into the double A-frame form, on account of the old bracing being pin connected. Whenever possible, a connection was made which did not make necessary the removal of the old pins, but this was impossible in some cases. For longitudinal bracing, the newly formed side trusses formed sufficient bracing down to the tops of the V-shaped columns, and the tractive forces are carried from this point to the ground by an entirely new system of bracing in the longitudinal plane of the legs of these new columns.

Extra care was exercised in all the details to allow for inconsistencies in the old construction. This was done by providing numerous shims and doing a great deal of field drilling that would otherwise not have been necessary. The entire job abounded in painstaking work in order that the new member would fit the old parts to which it should connect, and at the same time clear the old parts with which it was desired not to interfere.

ERECTION

The erection of the steel work was somewhat unusual, and while at first appearing somewhat formidable, is worked out satisfactorily and with reasonable economy, barring delays due to foundation trouble.

The old work was mostly field bolted, which made the occasional temporary removing of old members less expensive. The field drilling and riveting was an expensive item, as there were about 7000 holes to drill, 2500 old ¾-in. rivets to knock out and ream the old holes to ⅞ in., and about 28,700 rivets to drive.

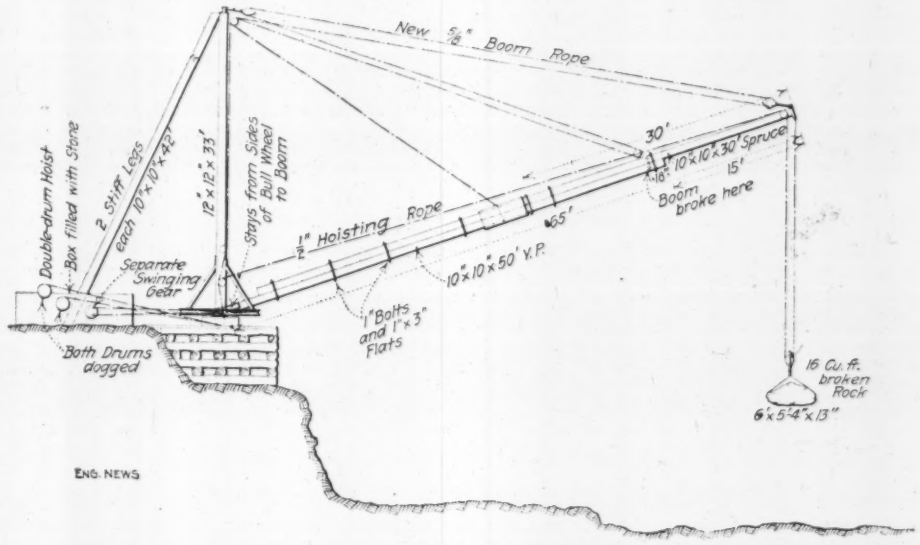
The new steel was handled by a derrick car at the beginning of the work, but this method did not prove entirely satisfactory, and a locomotive crane gave better results.

The river span was erected with very little falsework. The new steel columns were first erected at the ends of this span. Then the top chord was raised and suspended from the old structure with steamboat ratchets, the turnbuckles being placed so as not to interfere with traffic. All new top chord bracing was then placed, this being connected to the old trusses, and all bottom chord bracing removed. The balance of the new truss was then placed with falsework consisting of but a single wood post at either end, and the truss was kept suspended and controlled with 24 turnbuckles until completely riveted.

A Derrick of Which the Boom Broke

A recent derrick accident, in which the boom of the derrick broke and killed some workmen below, has led to discussion of right and wrong ways of rigging a derrick. We show a sketch of this derrick so as to put the matter before our readers and give them an opportunity to discuss the subject.

A stiff-leg derrick used in rock excavation, with a spliced boom 65 ft. long, was rigged with a five-part topping lift taking on to the end of the boom and two intermediate points as shown in the sketch. While hoisting a load of 16 cu.ft. of broken rock, the boom broke near the end of the main stick. This also happened to be the point where the middle sheave of the boom falls was attached.



DERRICK WHOSE BOOM BROKE

The contractor who used this derrick has all his derricks rigged in this same way, and so far as he knows the style of rigging is satisfactory. In the absence of any books on the subject of derricks and their rigging, information is desired from engineers and contractors familiar with the subject. Attaching the becket line of the boom falls to the boom below its top is little practiced today. The idea that the boom is strengthened by counterbalancing part of its weight is fallacious, as the varying pull of the line introduces changing and unknown bending stresses in the boom.

❖

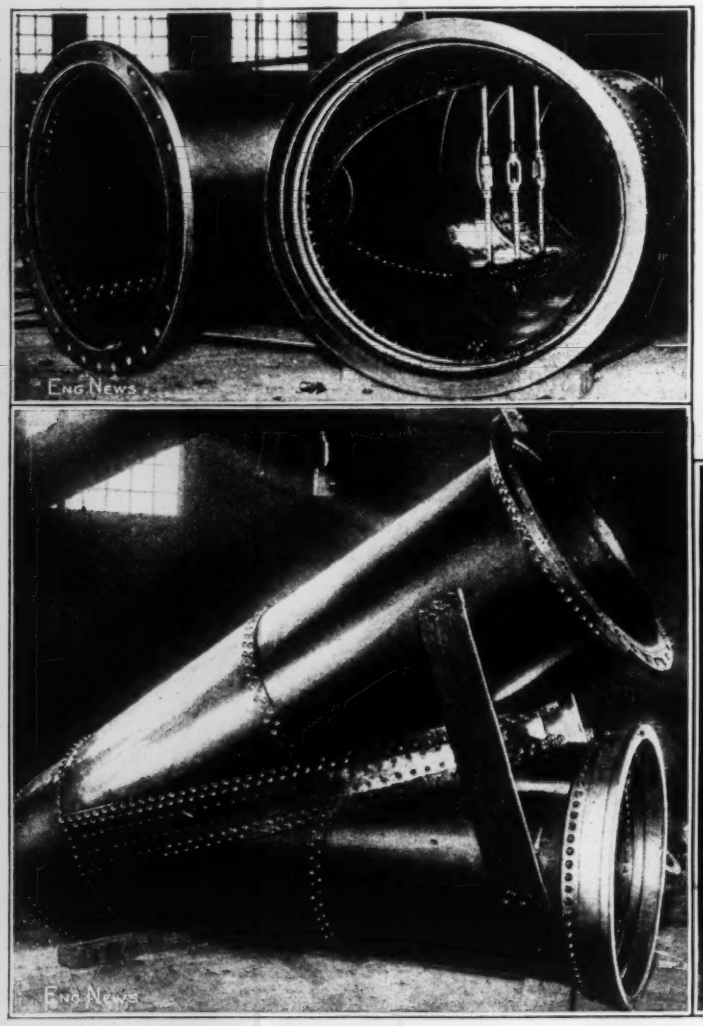
The Largest Manganese Steel Castings to date were recently made, so claims the Edgar Allen American Manganese Steel Co., for the Bethlehem Steel Co. The castings are two 52-in. reversing blooming-mill pinions, weighing 23,600 lb. each.

❖

The Effect of Inert Dust on explosions of gas is again considered in the third report of the Explosions in Mines Committee, appointed by the British Home Office. It will be recalled that Sir Frederick Abel, from experiments made some 30 years ago, held that the addition of calcined magnesia, or other incombustible dust, to a noninflammable mixture of gas and air, brought about a general inflammation immediately on contact with flame or after a few seconds. The committee has carefully repeated the experiments on which these findings were based, but eliminating certain arrangements which produced elements of uncertainty (such as the use of an injector for drawing in the dust-laden gaseous mixture). They find that the presence of noncombustible dust in weak gaseous mixtures does not render them more explosive than before, and that, to the contrary, the dust, being heat-absorbing material, renders the mixtures distinctly less explosive. The use of such dust, therefore, (as on shelf barriers to check the propagation of explosion and flame), seems to have its last lingering objection removed.

Large Riveted Steel Special Water-Pipe Joints

As a part of the 60-in. diameter riveted steel pipe for the North Side Reservoir, Pittsburgh, Penn., the two types of specials illustrated herewith have recently been installed. Five 60-in. diameter Y's and one 60x48x60-in. offset T were required and it was the original intention of the city to have them made of cast iron, about 1½ in. thick and properly reinforced. The James McNeil & Bros. Co., of Pittsburgh, however, proposed to make them of plate steel, and after consideration of their submitted designs the city accepted their proposition. Accordingly five Y's of the type shown in Figs. 1-2 and



FIGS. 1-2. RIVETED-STEEL 60-IN. SPECIAL FOR PITTSBURGH, PENN., RESERVOIR

one T, shown in Fig. 3, were built. The cost was lower than for the cast-iron specials originally considered.

The Y's were made of ⅝-in. soft openhearth flange steel plates. The two branches of each Y were united by a ¾-in. flanged plate, double riveted to the branches. Riveted on the inside of this mantle plate were two heavy angle irons with a baffle plate and three ⅞-in. bronze bolts with turnbuckles between. One branch of the Y's had a rolled-steel flange for connection to the valve, while the other branch had a cast-steel bell end for a lead joint connection.

The 60x48x60-in. T was made of ⅝-in. soft openhearth flange steel plates and was constructed as a 60-in. elbow with a 48-in. outlet. This 48-in. outlet was riveted to the elbow eccentrically, that is, the bottom of the 48-in. outlet was level with the bottom of the 60-in. elbow.

The shipping weight of the Y's was 14,000 lb. each and of the T 11,000 lb., one-third of the estimated weight of the cast-iron specials. All of the specials were tested at 100 lb. per sq.in. internal pressure.

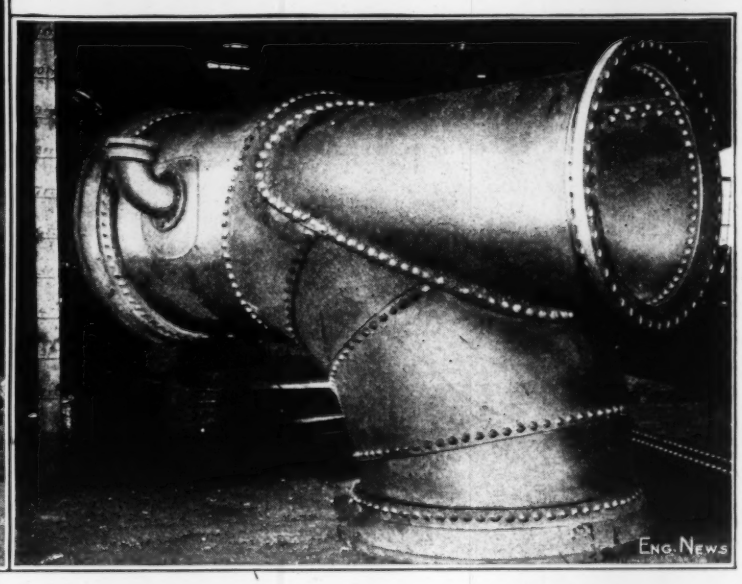


FIG. 3. OFFSET T SPECIAL, 60x48x60 IN.

Surveying Lots with Curved Boundaries

Several of our correspondents disagree with the methods and results of the survey of the lot layouts described in our issue of Apr. 24, 1913, p. 846, by J. H. Anderson, of Rock Island, Ill. As this is a problem which all land surveyors are sure to meet sooner or later, and as the methods described by Mr. Anderson are evidently not better than other methods, we give below some ideas on the subject from engineers who have had experience in similar work.

Sir—J. H. Anderson, in his article, seems in some cases to have contented himself with approximations in his computations where the determination of exact results by slightly different methods would have been equally easy. It also appears that he has not taken advantage of numerous chances to easily check his computations.

In the article the following statement appears:

In laying out work of this character it is not possible to run in the curves by the ordinary methods used in railway work; viz., defining the degree of curve as the angle subtended at the center by a 100-ft. chord. Chords should be computed so that the distance shown is the exact distance along the curve. In other words, the degree of curve should be defined as the angle subtended at the center by a 100-ft. arc.

Mr. Anderson, himself, apparently contradicts the latter part of this statement when he uses 1146.28 ft. for the center-line radius of the 5° curve at the south end of Forest Road; 1146.28 ft. is the radius of a curve which has a chord of 100 ft. subtending a central angle of 5°. Using Mr. Anderson's definition of a 5° curve the radius would be 1145.92 ft., which is the radius of a curve having a central angle of 5° subtended by an arc of 100 ft.

While this difference would not greatly affect ordinary arcs with so flat curves as this one, for very large central angles, or for curves of short radius, the error introduced would be of appreciable magnitude. For curves sharper than 13°, which in such a layout are often used, the error would be greater than 0.20 ft. per 100-ft. arc.

If the center-lines of the streets are run in by the regular methods used in railroad work the tables in Searles' or similar handbooks can be used without introducing any error; and the computation of frontages and chords for setting the

lot corners on the property line will not, thereby, be in any way complicated, but will, on the other hand, be simplified, since the radii of the property line curves are obtained by direct addition or subtraction of the half width of the streets to the center-line radii as taken from the tables.

Mr. Anderson uses the formula $C = 2R \sin \frac{1}{2} \Delta$ for the computation of chords and uses R as defined by a 100-ft. chord, where to be consistent with his previous statement he should use an R as defined by a 100-ft. arc.

Mr. Anderson's method of finding the length and bearing of the line between two points whose coördinates are known is unnecessarily laborious. The bearing is found by use of the formula $\tan Z = \frac{D_2 - D_1}{L_2 - L_1}$, where Z is the bearing angle. This Mr. Anderson has done. The length l can then be found by use of either the formulas $l = \frac{L_2 - L_1}{\cos Z}$ or, $l = \frac{D_2 - D_1}{\sin Z}$, which involves less work than by the use of the formula $l = \sqrt{(D_2 - D_1)^2 + (L_2 - L_1)^2}$ which he uses.

The problem illustrated by Fig. 1 is a special case of a general type. If the lot lines were not due east and west and north and south, i.e., parallel to the coördinate axes, the solution given would be applicable. A solution of the general case is here given:

Coördinates a		0.0	439.35
Log dif. lat	2.4213607	— 263.85	
Log cos 77° 02′ 15″	9.3508500		
Log 1176.28	3.0705107		
Log sin 77° 02′ 15″	9.9887894		
Log dif. dep.	3.0593001		+ 1146.30
Coördinates m = A		— 263.85	1585.65
Coördinates A	— 263.85	1585.65	
Coördinates C	65.00	0.00	
	328.85	1585.65	

Log 1585.65	3.2002073	Log 1585.65	3.2002073
Log 328.85	2.5169978	Log sin 78° 17′ 00″	9.9908553
Log tan Z	0.6832095	Log AC	3.2093520
Z	78° 17′ 00″	AC	1619.39

$\text{Sin B} = \frac{b \sin C}{c}$ $\qquad a = \frac{b \sin A}{\sin B}$

Log 1619.39	3.2093520	Log 1619.39	3.2093520
Log sin 11° 43′	9.3076503	Log sin 4° 31′ 04″	— 8.8963521
Log b sin C	2.5170023	Log b sin A	2.1057041
Log 1176.28	3.0705107	Log sin 16° 14′ 04″	9.4464916
Log sin B	9.4464916	Log a	2.6592125
B	16° 14′ 04″	a	456.27
Coördinates A		— 263.85	1585.65
Log dif. lat	2.5169988	+ 328.85	
Log cos 73° 45′ 56″	9.4464881		
Log 1176.28	3.0705107		
Log sin 73° 45′ 56″	9.9823281		
Log dif. dep.	3.0528388		— 1129.38
Coördinates B		65.00	456.27
Log. dif. lat	0.0000000	0.00	
Log cos 90°	$-\infty$		
Log 456.27	2.6592125		
Log sin 90°	10.0000000		
Log dif. dep.	2.6592125		— 456.27
Coördinates C	(Check)	65.00	0.00

This solution includes a complete check of the computations involved and shows errors in Mr. Anderson's coördinates of the point m, the bearing of the radial line mb, the central angle bma, the coördinates of the point b and the length of the north lot line. For this special case Mr. Anderson's solution is simpler than the one here given, but should have been checked by computing the coördinates of b from m, knowing the length and bearing.

Checking the problem of Mr. Anderson's Fig. 2 (p. 847) by the method used in checking the general problem given above shows an error in the coördinates of the point a.

It is, of course, impossible to solve the problem illustrated by Mr. Anderson's Fig. 6 (p. 848), since more conditions have been assigned than can be fulfilled by one simple circular curve. A solution of the triangle abc, which gives cp′ equal to 6.77 and cp equal to 6.97, proves this statement.

H. C. STEVENS,
W. W. SMITH,
With Blair & Drane,
Civil and Landscape Engineers.

Charlotte, N. C.
Apr. 26, 1913.

Sir—Concerning the description of the "Field Work and Computations for Laying Out Subdivisions on Curved Street Lines," by J. H. Anderson, in your issue of Apr. 24, it would be interesting to know how so many curves came to be in the layout, and what steps were taken to insure their accurate relocation in the future when the lots have become occupied by more or less contentious owners.

Apparently the ground is rugged and the streets were located closely to the contours, but could not more tangents and fewer curves have been used? Is not some consideration due future owners of the lots and to other surveyors who are perhaps not quite as fond of logarithms as Mr. Anderson is?

The fieldwork of locating all these curves and lots was not described, but it is presumed that the governing points of the curves were referenced to permanent subsurface monuments.

Judging from the size of the lots and the ruggedness of the ground, the lots are not very high in price, and many of them will in all probability be staked out by poorly paid surveyors who will not be as careful with their fieldwork as Mr. Anderson was with his figures; and as the section becomes more and more built up, trouble between contentious land owners will be relieved only by their willingness to compromise. Let us hope the surveyor on the job will have a saving sense of humor.

WALTER H. DUNLAP.

Roanoke, Va., Apr. 25, 1913.

Mr. Albert Compton Lyman, of Vancouver, B. C., sends us Fig. 2, giving the results of his computation, which do not agree with the results given by Mr. Anderson in our issue of Apr. 24.

Proof of these letters was submitted to Mr. Anderson and we have received the following reply:

Sir—My critics are correct when they state that I have used a radius for the 5° curve based on the railroad definition of degree of curve. I have done likewise for the 7° and the

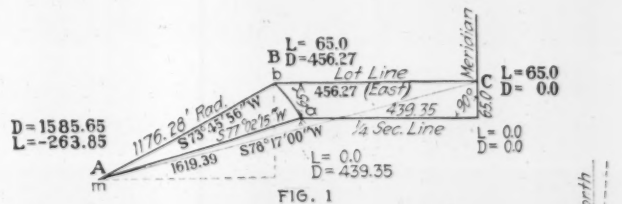


FIG. 1

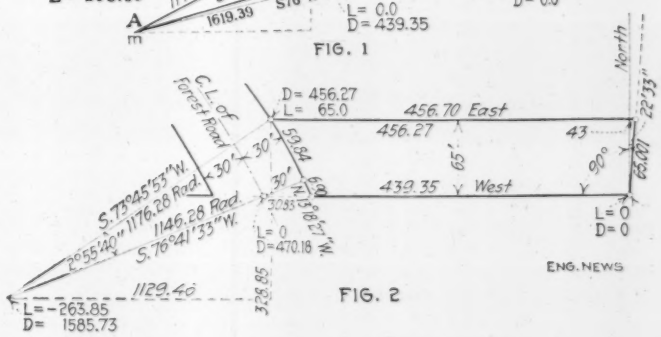


FIG. 2

4° curve which makes up the rest of Forest Road. This was done only on this street because the error introduced was negligible.

The error in the coördinates of point b is 0.07 ft., which can be neglected. In the light of these facts the statement that "degree of curve should be defined as the angle subtended at the center by a 100-ft. arc" is perhaps a little broad, but it is desirable in work of this kind, in fact it is absolutely necessary on sharp curves, to so define and use it.

I also find that the bearing of line in b in Fig. 1 is in error. The bearing should be S 73° 45′ 56″ W as given by my critic, and as will be found by using the coördinates of b and m in Fig. 1. The error was probably made in tracing.

My critics also give the length of the north lot line of Lot 180 as 456.27 ft., while my length is 456.59 ft.; 456.59 ft. is the length to the section line which is not the meridian; 456.27 ft. is the length to the meridian line and is not the length of the north lot line.

In regard to the method of finding the length of a line between two points whose coördinates are known, I do not know that finding l from $\sqrt{(D_2 - D_1)^2 + (L_2 - L_1)^2}$ is so much more laborious than finding it from $\frac{L_2 - L_1}{\cos Z}$, particularly as the latter method involves the looking up of an additional trigonometric function with its consequent chance for error and trouble in interpolating. Also, in using the latter method, any error in finding the bearing of the line will be introduced into the length, therefore the former is the more accurate.

Mr. Dunlap wants to know how so many curves got into the layout, and why more tangents were not used. Every effort was made to keep the streets as straight as possible without, at the same time, causing an excessive amount of excavation. Even as it is the cut and fill was very heavy in places. The curves are all referenced to permanent monuments and the lot corners marked by 1-in. gas pipe, in no case shorter than 2 ft.

Mr. Dunlap jumps at the conclusion that the lots are low priced and not very desirable. On the contrary they form a part of the most exclusive residence district in the city. The 70 acres described in this layout are the last of a tract of about 400 acres, all of which has been laid out on the above plan. The streets are all graded and paved; sidewalks, sewer, water and gas mains laid; and the lots are graded and sodded before being placed on the market. The residences are all of them of the highest class, several of them costing $100,000. The entire district is covered with fine old oak trees and the lots were laid out so as to give to each its proportionate shares of these. Also, in laying out the streets, consideration was given the trees so as not to destroy any more than necessary.

Mr. Dunlap is extremely worried over the trouble to the future "contentious" landowner and the "poorly paid surveyor." The first layout in this addition was made ten years ago and no trouble has been experienced in relocating these lots. A large scale map showing every deflection angle, chord distance, and all the bearings and distances is filed with the city engineer. I assumed that future surveyors were able to turn off an angle and run out a line whose bearing is given.

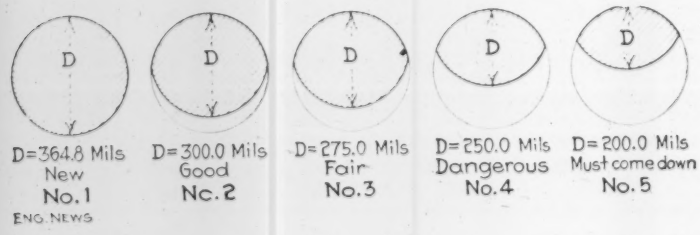
Mr. Dunlap concludes with the hope that the future "surveyor on the job will have a saving sense of humor." I am happy to state that the present surveyors on the job possess that quality and are therefore able to appreciate Mr. Dunlap's letter.

J. H. ANDERSON.

1025 Fourteenth St.,
Rock Island, Ill., June 9, 1913.

NOTES

Renewal Point of Copper Trolley Wire—The accompanying diagram, showing the practice of one of the large city railway companies of the country on the classification of trolley wires in place, as to their wear and renewal, is printed in the "O. B. Bulletin" (house organ of the Ohio Brass Co., Mansfield, O.) May, 1913. It is this operating company's practice to keep a monthly record sheet of the



wire breaks and every fall and spring an engineer takes micrometer measurements of the trolley wires in sections where the worst breaks occur. These measurements are taken 300 or 400 ft. apart, the results plotted and compared with the accompanying diagram.

Where wire is found in condition No. 3, it is found that the expected life is six months under heavy service. Wire which comes into the class of No. 4 is considered dangerous and is renewed as soon as possible. If found in condition No. 5 anywhere, it is renewed without delay.

Motor Trucks for Contractors—As an example of the economy introduced by motor trucks in transportation connected with engineering enterprises is the case of the Bridgeport Hydraulic Co., engaged in the construction of a large dam seven miles outside of Bridgeport, Conn.

Horse-drawn trucks were first considered as a means of transporting the materials to the dam, but on investigation it was found that in order to employ horses, the roads would have to be made over and, in one place, a hill cut down, with corresponding expense.

In addition, the estimates on the cost of hauling showed about 35c. per ton-mile (one team and driver, 2-ton load, one trip of seven miles each way per day) as compared with 14c. per ton-mile by motor trucks (four trips per day at 89c. per ton; 5 tons per trip of seven miles). Motor trucks were selected and the wisdom of the selection was manifest when the figures after over six months' operation showed the cost to average about 10c. per ton-mile, or 4c. cheaper than the estimate.

These trucks have never faltered in spite of the severe road conditions encountered. They have since been equipped with power mechanism for rolling onto the body a pipe 48 in diameter by 13 ft long, weighing 5 tons. Four trips per day are made to the dam, one pipe being carried each time, or four pipes per day moved. To do this same work, four teams of six horses each, with additional horses to assist on the hills, would be required. A trailer has been designed to carry an additional pipe on each trip.

In addition to the economy gained, the condition of the roads traveled by only one motor truck with broad tires, making four trips per day, is far better than it would be with four teams with narrow-tired wagons which cut into the road bed, especially in bad weather.—[From a paper on the "Economics of Motor Trucking," by Clinton Brettell, Truck Sales Department, Locomobile Co. of America, Bridgeport, Conn., in the "Quarterly" of the School of Mines, Columbia University.]

Effect of too Much Water in Mixing Concrete—The tests described in the article with the above heading in "Engineering News," May 22, 1913, p. 1063, has been commented on by E. J. Griesenaur, Cement Tester, C. M. & St. P. Ry., as follows:

The following paragraph in the article is not quite clear: "All material was dry before mixing and water was added in percentages from 20% to 42%, according to the following method: As a minimum, enough water was taken to moisten the stone and sand and then there was added 20% (of the amount of cement by weight) water."

It is not clear to me whether the percentages of water of 20% to 42½% is the amount of water added to the mixture after moistening the aggregate, or whether the water required to moisten the aggregate is included in the percentages given of from 20% to 42½% inclusive. If the former, then, it seems, the percentage required for that (to moisten the aggregate) should be given. If the latter, then it seems to me the statement as given in the paragraph quoted conflicts.

I would appreciate enlightenment in this matter in order to use the method, if possible, in conducting some tests along that line.

I might add that we have made a number of tests of different pit sands in the past couple of years, comparing the normal consistency mortar with a soft mushy consistency in tensile strength and the results obtained invariably showed the soft mushy consistency mortar briquettes to be much weaker than the normal consistency mortar briquettes.

C. J. Robison, who made the tests noted above, has replied as follows regarding our correspondent's query:

The amount of water which stone will absorb depends upon the stone and temperature. Connecticut trap rock was used and the temperature of the room was about 60°. Therefore, I did not think that the percentage of water absorbed by stone or sand was a constant quantity and, therefore the same per cent. of absorption would apply to all parts of the country under different conditions.

To make matters clearer, I will state that water was added in the following manner. By experiment I found that 2.1% of water (2.1% of the amount of stone by weight) was absorbed by stone, and that 10% water (10% of the amount of sand by weight) was absorbed by sand; and then added 20% water (20% of the amount of cement by weight, etc.)

The matter of determining the amount of water absorbed by stone and sand would take very little time, and it would be best for these tests to be made before starting work. However, one would be on the safe side if they assumed 2% water (2% of the amount of stone by weight) was absorbed by stone and that 10% water (10% of the amount of sand by weight) was absorbed by sand.

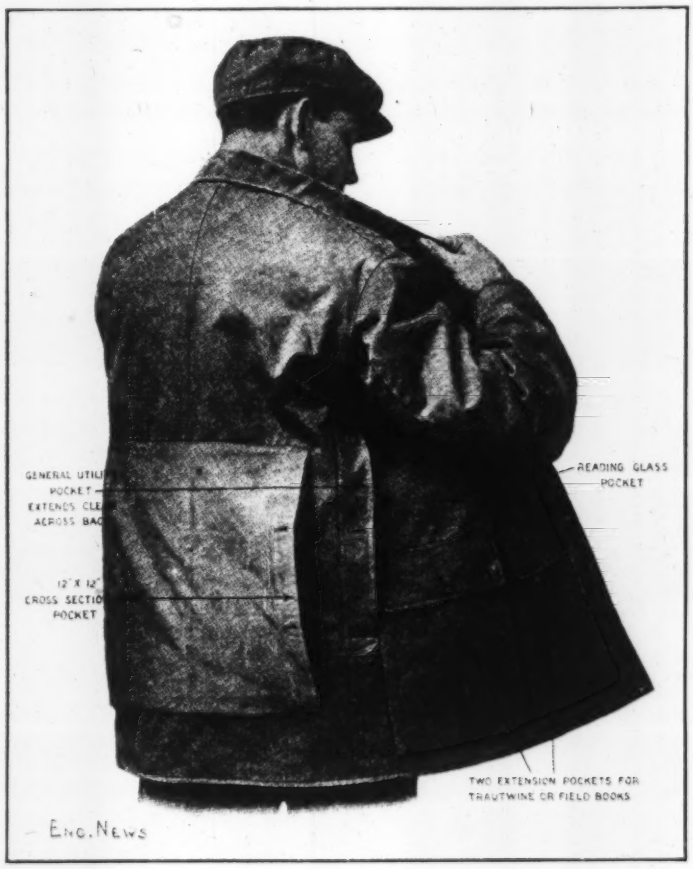
Bolted Field Connections for Bridges, as compared with riveted connections, are noted in a paper on the strengthening of an old railway viaduct, read before the Western Society of Engineers by W. T. Curtis. The viaduct was built in 1888 on a road now forming a part of the Pere Marquette R.R., with tower spans of 30 ft., intermediate spans of 45 ft., and a 150-ft. desk truss river span. The old structure was field-bolted (with the exception of the buck and lateral bracing between the girders), but this was not discovered until the field work of reconstruction or reinforcement had been commenced. The replacing of all old field bolts with new rivets was considered.

Careful investigation, however, showed the old structure to be in perfect alignment, with none of the bolts loose in the slightest degree, although the structure had seen years of service and had been somewhat overloaded in its later years. It was decided, therefore, not to go to the extra expense of replacing the bolts with rivets. On the other hand, many of the buck and lateral connections which had been riveted originally, were found to be in bad shape on account of loose rivets, the vibration of passing trains having caused the parts to wear deeply into some of the rivets.

While it was realized that the points which had been riveted in the old structure were points subject to more severe service than the points which had been bolted, the investigation satisfied those who participated in it that bolts are in reality much better than they are generally considered in ordinary practice. Mr. Curtis stated that other observations made under similar circumstances have supported this conclusion.

An Engineer's Field Suit—Specially designed duck clothing for hunters and fishermen has been in the market for many years, and has in some degree answered the purpose of the surveyor and field engineer. The firm of Bird, Jones &

Kenyon, of Utica, N. Y., has now designed a complete suit to meet the particular needs of engineers. The coat is shown in the accompanying illustration. This clothing is made in "Duxbak," which is waterproofed, and "Kamp-it," which is not waterproofed. The advantages of the various pockets



A Coat Specially Designed to Meet the Needs of the Engineer

are apparent to the experienced surveyor. Inside pockets are provided for pipes, tobacco, etc., on both sides of the coat, and on the right side is a small inside pocket designed for matches.

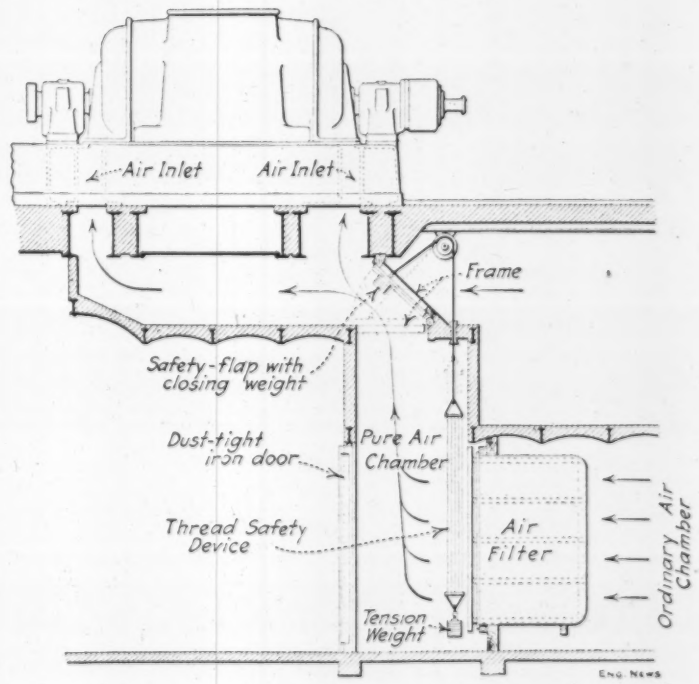
Accurate Method of Leveling with a Wye Level—The Borough of Queens, New York City, is one of those sometimes referred to as a "rural borough," because it contains much open land. A year or two ago this borough entered upon a comprehensive scheme for rapid improvements, and a preliminary was the organization of a topographical bureau, to obtain surveys as rapidly as possible on which to base the proposed improvements. An important part of this work, of course, was the establishment of a network of benchmarks. Equipments of precise levels were not available; and, moreover, speed and accuracy were prime requisites. An accurate method, which was found to have many advantages, was devised and used under the direction of H. K. Endemann, Assistant Engineer, and then acting Chief Engineer of the Topographical Bureau. This method consists of employing two rodmen, using ordinary target rods, reading to thousandths of a foot, and an ordinary wye level, chosen from several for its good qualities. The procedure was to set up at uniform distances of approximately 225 ft. from each rod, iron pins being used always for turning points, and have two independent target settings made on each turning point. These were read by each rodman and recorded in his book, and the mean was recorded by the levelman. The levelman then picked up his instrument and made another setup at the same point, and repeated the operation on the same turning points, recording his results in a separate field-book. Thus in reality two distinct level lines were obtained simultaneously and a double check on each rod reading was obtained. The limit of allowable error was 0.02 K (K = the distance in miles), and Mr. Endemann stated in a recent discussion before the Municipal Engineers of the City of New York that several hundred miles of levels were run much within this limit. The city is at present engaged in establishing a series of precise level benchmarks to which all the borough benchmarks will soon be referred.

Oxyacetylene Cutting Torches have been put to good use in cutting up old locomotive boilers. The rapidity with which iron and steel plate can be cut with this instrument has made its use a great economy.

Wrought steel in uncut fireboxes is worth $6.05 per ton compared with $10.75 per ton when cut into sheets that can be put under the shears, according to information furnished by the Oxweld Acetylene Co., of Chicago. It is stated that in general the cost of cutting up discarded boilers with oxygen and acetylene varies from 20 to 85% less than by hand tools—depending upon the thickness of the material and the amount of rust or scale adhering, together with local conditions under which the work has to be done.

It is reported that two 20-ton steel fire boxes were cut up for the shears in 12 hr. at a time cost of $1.22 with more than 300 lin.ft. of cut made through ⅞-in. plate. Another case is cited where the cut totaled 210 lin.in. through ½-in. plate, 9 in. through 3-in. plate, and 172 in. through ⅜-in. plate. This work was done in 53 min. at 8c. per lin.ft., average. It was estimated that two men would have done the work by ordinary hand tools in one week, whereas only 1½ days were required for the oxyacetylene torch. On another piece of work 78 ft. of ½-in. plate was cut in 2½ hr., and one piece 18 ft. long was cut in 13 min. The cost of cutting was 5.44c. per ft. Cutting of a certain three-ton boiler averaged $2 per ton and was done in 1½ hr., with a total length of cut 60 ft. 4 in. A 14-ton boiler was cut at the rate of $1.23 per ton in nine hours and with 111 ft. 8 in. of cut at the rate of 14.9c. per ft. A five-ton steel car frame was cut up in 2½ hr. at an average cost of $2 per ton.

Protection of Air-Cooled Electric Generators—It is reported by H. Treitel in the Allgemeine Elektricitäts Gesellschaft "Journal" for February, 1913, that frequent fires in the dry-air filters of German turbine-generator cooling systems, have led to the design of apparatus to interrupt the air supply quickly. The fundamental principle consists of the



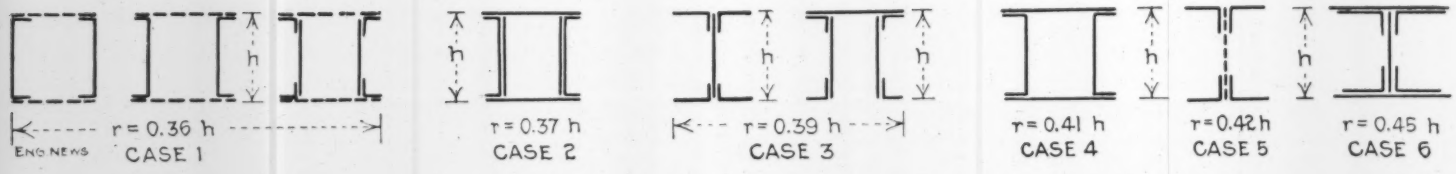
Fire Protection in Turbine Generator Cooling System

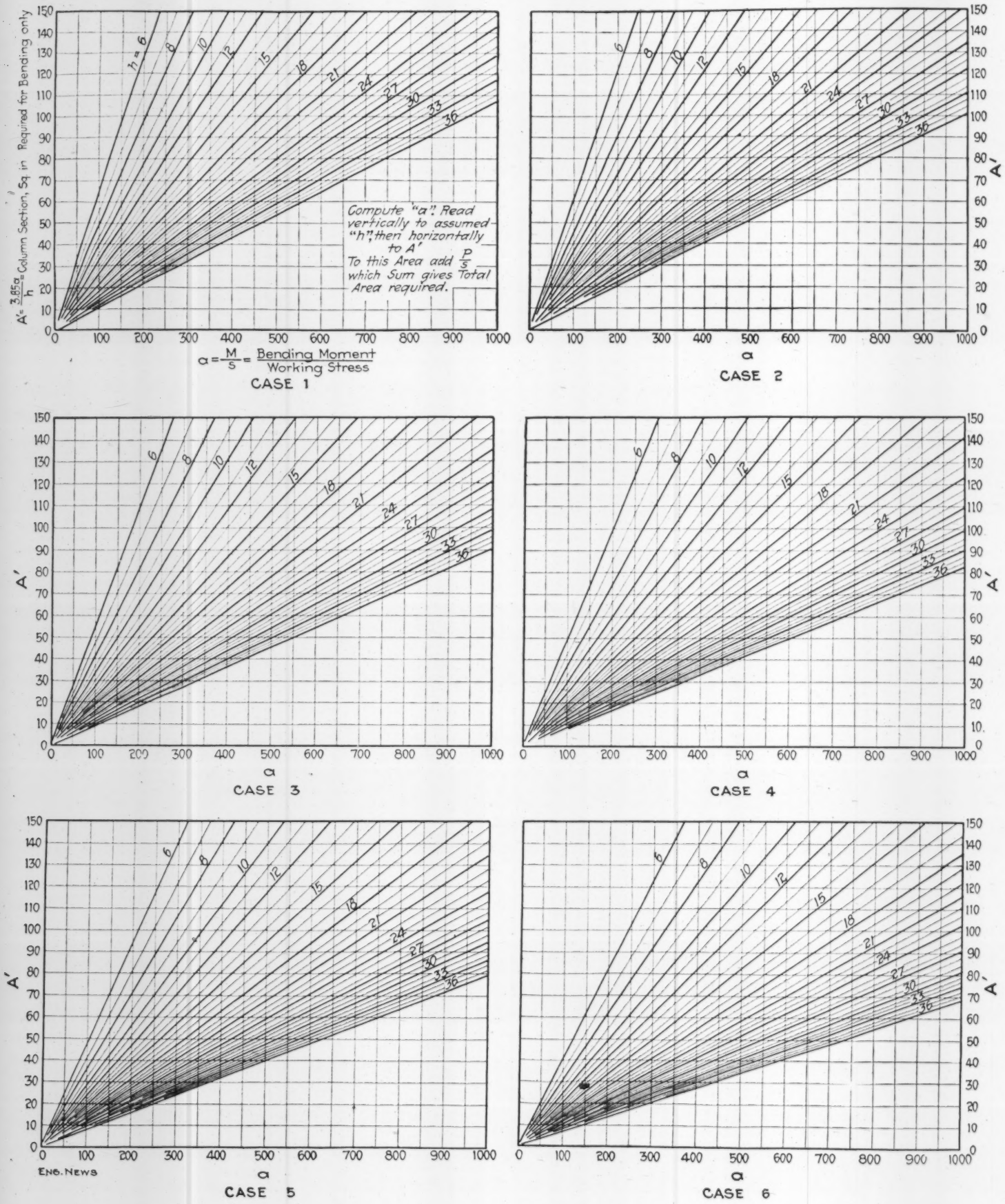
release in the air passage of some closing device, as a result of either temperature rise or spread of combustion. One such is shown in the accompanying figure. A counterweight, suspended by cotton threads, holds open a flap door; when the threads burn through, the door drops shut against the filtered-air supply and opens a passage to the machine-room cellar. Optical or acoustic signals give warning of the movement of the door.

Weight of Crushed Trap Rock—The following figures are given by F. R. Upton, Newark, N. J., on the weight of crushed trap rock of various sizes, the measurements being made at the quarry of the Bound Brook Crushed Stone Co., in carload lots:

Size	Lb. per cu.yd.	Lb. per cu.ft.
⅛-in. dust	2595	96
¾-in.	2370	88
1-in.*	2401	89
1¼-in.*	2537	94
1½-in.	2433	90

*Average of two cars.




A' = 3.85a/h = Column Section, Sq in Required for Bending only
h = 6 8 10 12 15 18 21 24 27 30 33 36
Compute "a". Read vertically to assumed "h", then horizontally to A'
To this Area add P/s which Sum gives Total Area required.
a = M/s = Bending Moment / Working Stress
CASE 1
A'
a
CASE 2
CASE 3
CASE 4
ENG. NEWS
CASE 5
CASE 6

DIAGRAMS TO BE USED IN DESIGNING COLUMNS, SUBJECT TO BOTH TRANSVERSE AND LONGITUDINAL LOADING

(Devised by G. Paaswell.)

A Direct Method of Designing Columns

By George Paaswell*

The design of a column subject to a transverse as well as longitudinal loading, involving as it does functions of the correct section (section modulus), is necessarily a matter of trial. Usually the functions of several sections must be calculated before the correct one is obtained.

The customary method of designing such a column is to use the formula

$$s = \frac{P}{A} + \frac{Mh}{2I}$$

where

s = stress allowed in compression;
P = direct load;
M = bending moment;
A = total area of required section;
h = depth out to out of column;
I = moment of inertia of column.

Since $I = Ar^2$, where r = radius of gyration, the formula may be written

$$s = \frac{P}{A} + \frac{Mh}{2Ar^2}$$

In a previous issue of Engineering News* relations

*May 23, 1912, p. 991.

between the radius of gyration and the depth out to out of various sections were given. If we put then $r = ch$, where c = a constant as determined by the method noted the formula becomes

$$s = \frac{P}{A} + \frac{M}{2c^2hA}$$

Solving for area of section,

$$A = \frac{P}{s} + \frac{M}{2c^2hs}$$

The section modulus required for the bending load only is $\frac{M}{s}$. Calling this a, the formula becomes,

$$A = \frac{P}{s} + \frac{a}{2c^2h}$$

Applying this general formula to the several cases shown in the accompanying figure we get

For Case 1. $r = 0.36h$ $\quad A = \frac{P}{s} + \frac{3.85\,a}{h}$

For Case 2. $r = 0.37h$ $\quad A = \frac{P}{s} + \frac{3.65\,a}{h}$

For Case 3. $r = 0.39h$ $\quad A = \frac{P}{s} + \frac{3.28\,a}{h}$

For Case 4. $r = 0.41h$ $\quad A = \frac{P}{s} + \frac{2.96\,a}{h}$

For Case 5. $r = 0.42h$ $\quad A = \frac{P}{s} + \frac{2.83\,a}{h}$

For Case 6. $r = 0.45h$ $\quad A = \frac{P}{s} + \frac{2.46\,a}{h}$

Curves are shown herewith for several types of columns, the areas required for various values of a and h for bending alone being shown at the left as A'. To these areas should be added the area required from the direct load alone, i.e., $\frac{P}{s}$.

In most cases h of the column is fixed or assumed. In cases where it is not, a glance at the curves will show an economic depth to be used (taking all items involved into consideration).

Since generally heavy sections are involved, the maximum stresses allowable from the column formulas of various specifications can be used.

Where light sections are used and the allowable stress is less than the maximum the allowable stress may be obtained directly (presupposing the value of h has been adopted) by substituting in the specified formula for stress the value of h.

Thus if $r = 0.4h$ and the New York Building Code is specified

$$s = 15{,}200 - 125\frac{L}{h}$$

Since girders are customarily designed by area, although theoretically we must design by moment of inertia, it is justifiable to design the columns by area also.

*Public Service Commission, First District, New York, 154 Nassau St., New York City.

Filing and Indexing System for Boston Harbor Development Work

Frank H. Jones*

The novel feature of the filing system adopted by the engineering department of the Directors of the Port of Boston, Mass., which makes it especially applicable to the use of public service commissions, designing and construction engineering firms, is the relative speed and accuracy with which it permits of a physical valuation or report of the actual work accomplished, as set apart from the more general data collected in the course of engineering and administration.

The decimal system is used as a basis and the field of the work is first divided into the following topic divisions:

0. General
1. Rivers
2. Harbors
3. Dry Docks
4. Piers
5. Land
6. Grain Elevators
7. Railroads
8. Viaducts and Bridges
9. Highways
10. Warehouses
11. Power Plants

With an increase in the scope of the work other topic numbers may readily be added with no interference whatever with matter already filed.

It will be noted in the following specimen topics that when a numerical subdivision is once assigned it carries a definite, tangible idea throughout the entire system. For instance, the subdivision .02 occurs under 3. as the file number which is assigned to all the progress reports in connection with a contract for the construction of a dry dock. The same subdivision having identically the same meaning occurs under 4 in connection with pier contracts and again under 6. 8. 10. and 11. This process of standardizing the meaning of the subdivisions is carried out all the way through the topics.

The subdivisions of 1. Rivers and 2. Harbors are practically the same. The considerations outlined under 3. Dry Docks, 4. Piers, 6. Grain Elevators, 10. Warehouses, 11. Power Plants, and all minor construction topics and subtopics are treated in much the same manner throughout, showing the facility with which the system is comprehended by even the most inexperienced user.

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The filing of the data is done under two general classifications, "Contract" and "Miscellaneous," both of which are divided and subdivided as far as necessary by means of the decimal system outlined under the various topics considered.

The filing under classification "Contract" is by contract numbers which are consecutively assigned as soon as possible after a proposition becomes the basis of a contract, and the data under one contract number are placed in the file in alphabetical order. The filing under classification "Miscellaneous" is by alphabetical arrangement of locations and subjects.

The same index is used for both filing classifications of data and is arranged alphabetically to include both locations and subjects. Contract data are grouped under their proper alphabetical location and distinguished by a guide card stating the subject of the contract; and the group has as many decimal divisions as are necessary for quick reference. Miscellaneous data, either of location or subject, are grouped under the proper alphabetical location or subject and distinguished by the proper topic number.

The primary aim in working out this system was to group, as far as possible, all interrelated subjects and only set apart, under as few heads as consistent with ready reference, all considerations which could be definitely bounded in scope. The word "general" has been construed in every case in its broadest sense, and the word "miscellaneous," long abused by file clerks, has been done away with almost entirely except in reference to a class of data distinctly separate from contract or actual improvement work under the jurisdiction of the department.

The method of divisioning is explained more in detail as follows: 0. General, pertains to office and engineering administration; 2. Harbors, treats of all harbor improvements, contract data as well as proposed work and miscellaneous data; 4. Piers, contains all data concerning the construction of a pier.

It should be especially noted throughout the divisioning that the manner in which the topics are treated allows of future expansion without altering the present scheme.

The more important topics and their subdivisions are outlined as follows:

0. ORGANIZATION AND ADMINISTRATION OF THE ENGINEERING DEPARTMENT
.1 LEGAL CONSIDERATIONS
.11 Opinions of Counsel
.12 Contracts
.13 Contractors
.131 List of Bidders
.14 Permits, Agreements, Franchises, Patents
.15 Damages (Personal and other—not real estate, for which see LAND 5.)
0.2 EMPLOYEES
.21 Titles
.22 Time and Expense Reports
.221 Weekly
.222 Monthly
.23 Addresses, Credentials.
.24 Accidents
.25 Salaries, increase, decrease, promotion
.26 Absence, Vacations
0.3 OFFICE ADMINISTRATION
.31 Rentals, Leases, etc.
.32 Regulations, Instructions, Office Practice (sizes of drawings, computations, symbols, titles, etc.)
.33 Accounts
0.4 FILING AND INDEXING
0.5 SUPPLIES AND EQUIPMENT
.501 Field Orders
.502 Requisitions
.503 Orders
.51 Furniture and Office Equipment
.52 Stationery and Blank Forms
.53 Engineering and Drafting Supplies and Instruments
0.6 REPORTS, PUBLICATIONS, ADVERTISING
.61 Catalogs
.62 Periodical and Other Reports
.63 Periodical Publications
.64 Advertising
.65 Printing
.651 Process Printing
.652 Photographs
0.7 DESIGNING STANDARDS
0.8 SPECIFICATIONS

2. HARBORS

2.0 GENERAL
.01 Charts, Maps, Surveys
.011 Studies, Schemes, Considerations for Proposed Developments
.02 Tide water displacements
2.1 DREDGING
.11 Preliminary to Contract
(General Plan, location, borings, soundings, diagrams and other information necessary for a clear interpretation of all existing conditions on the site at the time of contract.)
.111 Studies
(Studies of preliminary and working considerations for the contract.)
.12 Progress, Completion, Maintenance
(Progress data, diagrams, overdepth estimates and reports showing conditions after improvement.)
.13 Plant, Force, Material
(Temporary Structures, force, material, and testing data.)
2.2 BREAKWATERS, DIKES, EMBANKMENTS
(Subdivisions same as under 2.1)
2.3 RECLAMATION OF LAND
(Subdivisions same as under 2.1)
2.4 AIDS TO NAVIGATION
(Subdivisions same as under 2.1)
2.5 CHANNELS AND ANCHORAGE BASINS
(Subdivisions same as under 2.1)
2.6 ISLANDS

4. PIERS

4.0 GENERAL
.01 Preliminary to Contract
(General plan and location, borings and soundings, diagrams and other information necessary for a clear interpretation of the existing conditions on the site at the time of contract.)
.011 Studies
(Schemes of preliminary and working considerations.)
.02 Progress, Completion, Maintenance
(Progress, and data relating to the conditions upon completion and future maintenance.)
.03 Plant, Force, Material
(Temporary structures, force, material and testing data.)
.04 Railroad Connections and Construction
4.1 SUBSTRUCTURE
.11 Dredging, Excavation, Filling, Surfacing, Grading, Highway Connections.
.12 Retaining Walls, Sea Walls, Piles and Pile Work
.13 Platform
4.2 SUPERSTRUCTURE
.21 Foundations, Floor Plans, Elevations, Sections and Details.
.22 Structural Steel
4.3 UNDERGROUND PIPING, PLUMBING, WATER SUPPLY, DRAINAGE, SEWAGE, HEATING AND VENTILATING, PRESSURE SYSTEMS
4.4 ELECTRICAL, POWER AND LIGHTING
.41 Distribution
.42 Appliances
4.5 MECHANICAL

The subjects 7. Railroads and 9. Streets are topics to which the Board has frequent reference, though at present no jurisdiction over such construction or designing work; and their filing treatment is very simple, the first division (9.1) being left for contract considerations should they ever exist while 9.0 constitutes the general file with the subdivision 9.01 as "Characteristics of existing streets" (such as sewers, lines, drainage, etc.), and the subdivision 9.011 as "Studies for proposed alterations and extensions."

The following extracts from the special instructions for filing plans and drawings show the manner in which data relating to a specific topic are automatically drawn together and made ready for instant reference as a whole or in part:

All plans, drawings, studies, etc., shall be accessioned (consecutively numbered, as the means of referring to them) when a title and all filing information have been determined. . . . When the drawing is completed it is given its proper file number.

Contract plans, not exceeding folder size, shall be located in folders numbered and arranged according to the contract numbers and their subdivisions. When two or more folders are required for the plans of any decimal division the limiting accession numbers shall be indicated on the cover of each folder.

Miscellaneous plans not exceeding folder size shall be located in folders (1) alphabetically and (2) decimally arranged.

Contract or miscellaneous plans exceeding, or under, folder size shall be rolled and their location plainly marked in all the entries.

EDITORIALS

What is a Proper Safe Unit Stress for Timber?

An interesting review of the unit stresses fixed by the building ordinances of various cities for yellow-pine timber used in buildings was recently made by Mr. A. D. North, a Chicago engineer, in a paper before the Yellow Pine Manufacturers Association. The results of Mr. North's inquiry may be briefly summarized as follows: A maximum stress of 1200 lb. per sq.in. on the extreme fiber of wooden beams is allowed by the cities of Atlanta, Cincinnati, Columbus, Detroit, Washington, Louisville, Memphis, New York, Pittsburgh, Richmond and St. Paul. Their total population is in the neighborhood of 7,500,000. The cities of Chicago, Birmingham and Trenton, with a total population of 2,400,000, allow 1300 lb. fiber stress. Lowell, Mass., allows 1400 lb. fiber stress. Boston, New Orleans and Newark allow 1500 lb. fiber stress. Paterson, Philadelphia and Minneapolis allow 1600 lb. fiber stress. A fiber stress of 1800 lb. is allowed in Buffalo, Baltimore, Chester, Evansville, Cleveland, New Haven, St. Louis and Toledo, their combined population being 2,640,000.

Mr. North urges that if an extreme fiber stress of 1800 lb. per sq.in. is safe in the cities last named, then the cities first named are requiring by law to use 50% more material in the construction of wooden buildings than is necessary for safety. That is to say, if a certain load is carried safely by a 2x10 floor joist in Buffalo, or Baltimore or St. Louis, the same load would require a 3x10 floor joist in the cities of New York, Pittsburgh, St. Paul, Detroit, etc.

Mr. North declares that the use of the low fiber stress of 1200 lb. for yellow pine in building codes is at the present day due either to ignorance or to the activities of special interests. He admits that such stresses were recommended in a model building code issued by the National Board of Fire Underwriters years ago, but he states that that code is now being revised. He urges, furthermore, that the interests which have favored the use of fireproof materials in buildings have been active in opposing any increase in the allowable stresses in structural timbers.

Without taking any position in support of Mr. North's claim that timber stresses are too low in many cities, it certainly is an interesting question what justification there is for a fiber stress of 1200 lb. on the one hand or of 1800 lb. on the other. If the Baltimore building law is safe, then the New York law does require a wasteful use of the material. On the other hand, if the New York law represents the maximum stress which should be permitted upon timber, then the Baltimore ordinance endangers public safety. Evidently, both extremes cannot be right.

Mr. North urges that a factor of safety of 6 or more for timber is unreasonably high and subjects those who use timber for building purposes to an unfair and burdensome tax. One remark which may probably be made in connection with this is that if every structure could be planned and supervised by a competent engineer, then higher factors of safety might reasonably be used on many timber structures. A building law, however, must be made to fit the worst timber which passes the average commercial inspection. As is well known, much of the timber accepted in the present-day market is full of knots and other defects which reduce the maximum strength of many pieces considerably below the average strength which prevailed in the sound and clear timber which was ordinarily obtainable in the market twenty-five years ago.

Reasonable economy in building construction is highly desirable and timber construction in proper places ought by no means to be handicapped by excessive factors of safety. On the other hand, the public safety should not be sacrificed in any city building ordinance. There is not one case in ten thousand where those whose lives are at risk in a city building have or can have any knowledge of the strength of the structures in which they live and work.

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Advertising Franchises in New York City

A generation ago, when public franchises were a subject for barter and sale between boards of aldermen and promoters, some excellent reformers succeeded in inserting into the laws of several states a provision that public advertisement of a franchise must be made for a certain period before it could be granted. Some of the present-day results of this law, which were never foreseen by those who framed it, have been pointed out in a recent report by the Bureau of Franchises of New York City, of which Mr. Harry P. Nichols is chief.

The idea of the framers of the law, of course, was that a franchise was such a valuable thing that the cost of advertising its grant in local newspapers would be a mere bagatelle for the parties desiring to obtain the franchise. The framers of the law, however, did not foresee that where there would be one franchise granted of such value as that for the street railway on Broadway or the construction of underground conduits for electric wires over a large section of the city, there would be fifty franchises to be granted for minor public utilities, the value of which to the holders would be comparatively trifling.

In the report above referred to it appears that the necessary cost of the advertising in connection with grants of franchises to street surface railways in the Borough of Manhattan, New York City, is from $2500 to $4000. A railway on Staten Island obtained franchises for four short sections of track and the cost of publication alone amounted to nearly $1 per foot of track laid. In several other cases cited the cost of the the advertising has been as great as the revenue which the city would receive from the franchise for a long term

of years. In still another case where a concern had run some wires in a street, it was found that the concern was barely earning its operating expenses and that if it were required to go through the legal procedure necessary to obtain a franchise, it would be driven out of business.

Mr. Nichols recognizes the importance of the enforced publicity which the present law secures, but urges that modification should be made so as to reduce the cost of advertising under the present system.

We suggest that it would be well to go even further and inquire what useful purpose is served by a large proportion of the so called "legal advertising" other than to furnish a source of revenue to various political newspapers. Of course, there is a certain amount of this advertising which is of public interest and importance. Much of it, however, is published simply because the law requires it and gives no such useful and valuable publicity as the law requiring it originally contemplated.

A Recommended Excursion

Engineering structures as a rule do not receive much attention in print until after their completion, which is good practice, since it insures the gathering together in one place of all the information regarding the structure in question. It is unfortunate, sometimes, because it often happens that many engineers do not know of certain operations until after they are completed, and the methods which might have been of interest are then not open to observation. On this account we would like to call attention as prominently as possible to the construction now going on at the Tunkhannock Creek Viaduct, on the Summit Cutoff of the Deleware, Lackawanna & Western R.R., west of Scranton, Penn.

This viaduct, a general description of which appeared in ENGINEERING NEWS, June 21, 1912, p. 1110, will be, when completed, the largest concrete structure ever built. It has a total length of 2230 ft. and is made of two 100- and ten 180-ft. arch spans, carrying a double-track railway about 240 ft. above the level of the creek. The massive piers, 40x46 ft. in plan, rise up out of the valley to this enormous height and reach down 95 ft. below the ground surface to a footing on bed rock. Undoubtedly they are the largest monolithic shafts ever built.

During the coming summer this work will be at its height. Construction of the piers has been going on all winter and some of them have already reached the skewback elevation. The steel-arch centers, on which the long arches will be built, will be put in place within the next few months, while at the same time pier construction for some of the shorter piers will be going on. Many construction features are of interest, particularly a tower cableway with a central tower higher than any ever before built, and a material storage plant remarkably compact in arrangement.

This bridge is located at Nicholson, Penn., about three-quarters of an hour north of Scranton on the main line of the Lackawanna R.R. It is easily reached on that road from Hoboken in the south, and from Buffalo, Elmira or Binghamton in the north. We know of no excursion in the eastern part of the country which would better repay an engineer than a visit to the site of this bridge and to the somewhat smaller but similar Martin's Creek viaduct about ten miles farther west.

A Supreme Court Ruling on Government Ownership of the Water Power of Navigable Streams

"Ownership of a private stream wholly upon the lands of an individual is conceivable; but that the running water in a great navigable stream is capable of private ownership is inconceivable."

The above quotation is not an excerpt from some address on censervation. It is taken from the opinion of the Supreme Court of the United States in the case of the Chandler-Dunbar Water Power Co. At Sault Ste. Marie, Mich., the United States is building a new lock for navigation and has caused to be removed the water-power plant which the Chandler-Dunbar Co. had built. The lower courts awarded the company damages to the amount of $550,000 as the value of its water power taken by the Government. The Supreme Court threw out this award and in a most sweeping opinion declared that the United States has the ultimate authority over the beds of all navigable streams and may exercise that authority without interference from or compensation to the owners of the lands fronting on the stream. The following quotation gives some idea of the broad character of the Supreme Court's ruling:

> This title of the owner of fast land upon the shore of a navigable river to the bed of the river is at best a qualified one. It is a title which inheres in the ownership of the shore and, unless reserved or excluded by implication, passes with it as a shadow follows a substance, although capable of distinct ownership.
>
> It is subordinate to the public right of navigation, and however helpful in protecting the owner against the acts of third parties, is of no avail against the exercise of the great and absolute power of Congress over the improvement of navigable rivers. If, on the judgment of Congress, the use of the bottom of the river is proper for the purpose of placing therein structures in aid of navigation, it is not thereby taking private property for a public use, for the owner's title was in its very nature subject to that use in the interest of public navigation. If its judgment be that structures placed in the river and upon such submerged land are an obstruction or hindrance to the proper use of the river for purposes of navigation, it may require their removal and forbid the use of the bed of the river by the owner in any way which in its judgment is injurious to the dominant right of navigation. So, also it may permit the construction and maintenance of tunnels under or bridges over the river, and may require the removal of every such structure placed there with or without its license, the element of contract out of the way, which it shall require to be removed or altered as an obstruction to navigation.

Not only may the Federal Government improve rivers for navigation without compensating the riparian owners because of their technical title to the bed of the stream but it may develop and lease water powers on navigable rivers and the riparian owners of adjoining lands have no claim on the value of such powers. The Court says:

> The 12th section of the act of 1909 declares that the conservation of the flow of the river is
> "primarily for the benefit of navigation and incidentally for the purpose of having the water power developed, either for the direct use of the United States or by lease . . . . through the Secretary of War."
>
> If the primary purpose is legitimate, we can see no sound objection to leasing any excess of power over the needs of the Government. The practice is not unusual in respect to similar public works constructed by State governments.
>
> It is, at best, not clear how the Chandler-Dunbar Co. can be heard to object to the selling of any excess of water power which may result from the construction of such controlling or remedial works as shall be found advisable for the improvement of navigation, inasmuch as it had no property right in the river which had been "taken." It has, therefore, no interest whether the Government permit the excess of power to go to waste or make it the means of producing some return upon the great expenditure.

Social Problems and the Engineer

We hope that every young engineer among our readers will take the time to carefully read the presidential address of Prof. George F. Swain, President of the American Society of Civil Engineers, delivered at the Ottawa convention last week and printed on another page of this issue. It is faint praise to say that Prof. Swain's address is worthy of the highest traditions of the engineering profession. The traditions of the profession too often are that the engineer should stick closely to his special work in technical and scientific matters.

As our readers know, ENGINEERING NEWS has for many years contended earnestly that engineers were as much responsible for the solution of social problems and the development of good citizenship and good government as any class of men in the community. Prof. Swain's address, in fact, breaks loose from all traditions and discusses those broad fundamental questions of sociology, of government, of education, of industry, on which in the last analysis the continuity of our civilization depends. The sole criticism that can be made of President Swain's address is that it dealt with themes too deep and profound to receive proper attention at a summer holiday meeting of an engineering society. The answer to this is that undoubtedly President Swain was looking beyond, to the larger audience which he might justly hope to reach, in view of the prominence of the occasion and the official character of his utterances.

Available space permits us to publish only a condensed abstract of his address, which by no means does it full justice. We strongly advise our readers not to content themselves with reading the abstract which we present, but to take pains to obtain the full text of the address when printed and made available to the profession by the Society, as it undoubtedly will be.

We shall attempt no discussion here of the important questions raised by Prof. Swain. We will only remark that he gave forceful expression in a masterly manner to the ideas that are in the minds of thousands of earnest thinking men. There can be no doubt at all that if the engineering profession would fulfill its opportunity for public leadership it must give earnest study and consideration to the great problems to which Prof. Swain has called attention.

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Air Brakes and the Stamford Collision

Not in a long time have there been tests of air brakes so full of interest as those which were made last week at Stamford, Conn., with the locomotive and cars of the second section of the Boston express which collided with the section ahead on the afternoon of Thursday, June 12. Orders had been given that the brake equipment of the locomotive and cars be in no way interfered with and on June 17 the train was run to the place where the collision occurred and stops were made with it, over the same stretch of track, the brakes being applied in different ways.

According to the figures of these tests published in the *New York Times*, for test No. 1 a train speed of 64½ miles an hour was obtained when emergency application of the brakes was made. The train was stopped after running 2097 ft. For the second test a full service application of the brakes was made with a reduction of pressure in the train pipe of 30 lb. The brakes were applied when the train was running 60 miles an hour and the train was stopped in 1994 ft. In the third test an emergency application was made at a speed of 57½ miles an hour and the train was stopped in 1617 ft. In the fourth test an emergency application was again made at a speed of 60½ miles an hour and the train was stopped in 2525 ft. In the fifth test, with the train running 59½ miles an hour, a service application of 15 lb. was made followed shortly after by a further reduction of 15 lb. more. The train was stopped in 47 sec. after running 2586 ft. In the sixth test the train was stopped from a speed of 57 miles an hour, in 50 sec. time, having run 2138 ft.

In the seventh test the conditions were reproduced under which Engineer Doherty testified that he applied the brakes on the day of the collision. His testimony was that he made a service application with 10 lb. reduction when he saw the distant signal at caution, 5 lb. more after running 200 ft. and then applied the emergency. In this test the train ran 2296 ft. before stopping, which carried it 375 ft. further than the point where the rear of the second section was located on the day of the fatal collision.

Our account of the accident last week, made up from such newspaper reports as were then available, stated that according to Doherty's testimony he applied the emergency when only 200 ft. from the rear of the section ahead. The above account would indicate that the brakes were applied very much farther back. In a still later statement, made by the Coroner on opening the session of the inquest on June 20, it is declared that Doherty shut the throttle of his locomotive when 3300 ft. east of the distant signal, that he made a service application of the air brake with 15 lb. reduction when 1200 ft. from the distant signal and an additional service application with 10 lb. reduction when 300 ft. east of the distant signal, and that when he was 500 ft. past the distant signal and 1300 ft. from the home signal he applied the emergency.

There is, of course, nothing but Doherty's testimony to show that he applied the brakes as above stated; and the tests above reported are strong evidence that had he applied the brake at these points the train would have been stopped in time.

We suggested last week that the break-in-two of the colliding train when the emergency application was made at the time of the collision indicated that the brakes on the locomotive might not be holding properly. However, according to the testimony of P. J. Langdon, chief air-brake inspector of the Lackawanna R.R., the brake equipment on the locomotive was all in first-rate condition with the exception of the air-brake pump governor which had become clogged with dirt and required cleaning. Mr. Langdon also testified, however, that on testing the air-brake equipment on the cars he found that the brake on one of the Pullman cars of the train required a 20-lb. reduction in train-pipe pressure to operate. Under these conditions the brakes on this car would not be set at all in ordinary service application and would only be applied by the emergency.

It is of interest to record, however, that when a test was made with the trial train to determine the relative stopping power of the locomotive and the cars, the locomotive being cut loose from the train when the brake

was applied, the result was that the locomotive ran a long distance ahead of the cars before it was stopped. The published explanation is that a pin dropped out of the air-brake gear on the locomotive and rendered the brakes inoperative. It is rather extraordinary that a brake gear on an express locomotive only recently put in service should be in such a condition that an accident of that sort should be possible. One is led to question whether any such thing really happened and whether the real fact was not that the braking power on the heavy locomotive was actually inadequate to exert anything like the stopping power of the brakes on the train.

The time and expense devoted to the investigation of this collision will be well repaid without doubt in the stimulus that it will give to better maintenance of air brakes wherever the news of this investigation extends. It is altogether probable that if an expert investigation were made, there would be found features to be criticized in the air-brake practice of probably half the railway companies of the country.

The air brake is in fact a marvel of mechanical ingenuity in that notwithstanding its exceedingly complicated construction it operates with marvelous reliability over long periods of time with comparatively very little attention. When, however, some such accident occurs as this at Stamford, it serves to call public attention to the fact that the hard-working and comparatively unknown air-brake inspector, engaged in his ceaseless round of oiling and cleaning cylinders and triple valves is rendering a service on whose faithful and conscientious performance the safety of the traveling public depends.

The United States Supreme Court on Principles of Railway Valuation

In the recent decision of the United States Supreme Court on the Minnesota rate cases, some important principles are laid down with respect to railway valuation and its relation to railway rates, which are of especial interest at this time when the valuation of all the railways of the United States is about to be undertaken under the direction of the Interstate Commerce Commission.

In the Minnesota rate cases, several railway companies appealed to the Federal courts on the ground that the rates put in force by the State authorities were so low as to be confiscatory, or in other words to deprive the owners of railway property of their possessions without due process of law. In order to determine whether or not the rates fixed by the State reduced the net return to the owners of the railway below a fair rate of income from their investment, it became necessary first of all to find what was the fair value of the property. The lower Federal courts had already made an estimate of the value of the property, based largely upon the valuation made by the State of Minnesota. Quoting from one of its previous decisions, the Supreme Court says:

> In order to ascertain the fair value of the property, the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stocks, the present as compared with the original cost of construction, the probable earning capacity under particular rates prescribed by statute and the sum required to meet operating expenses are all matters for consideration and are to be given such weight as may be just and right in each case.

The lower Federal courts, however, in the present case declared that the value of bonds and stocks issued by a company was a wholly unreliable basis for determining the value of the property as a basis for rate making. The Supreme Court approves this viewpoint. In the lower courts, also, much evidence was produced to show the actual cost of construction and equipment of the entire railroad system from its origin down to Apr. 30, 1908. These figures, however, could be definitely shown only by the corporate books and records, and in the early history of the original company, these are somewhat obscure and uncertain and by reason of lapse of time could not be verified by other proof. The lower courts, therefore, held that it was impossible to fix reasonable rates upon the original investment made by the railway as a basis. They took, therefore, as their basis for fixing a reasonable rate, "the cost of reproduction new." On this basis the lower courts found the value for the entire Northern Pacific R.R. system to be $452,666,000, which is considerably in excess of the total outstanding bond and stock issues of the company.

The Supreme Court, however, proceeds to discuss the method by which this valuation or "cost of reproduction new" was arrived at. It appears that in estimating the value of the real estate owned by the company and used for the right-of-way of its railways and for city terminals, etc., that the appraisers took, not the market value of the property alone, but "the value of the property for railway purposes." In other words, the appraisers made a valuation of the right-of-way owned by the company outside of city limits on the basis of the fair market value per acre compared with contiguous lands alongside and multiplied that sum by three. This procedure was defended upon the ground that in condemnation proceedings the company would be obliged to pay somewhat more than the fair market value and would have to bear the expense of the proceedings as well. They would have to pay also consequential damages by reason of removal of buildings and other results of the use of the property for railway purposes. It was also argued, however, that because this land was owned in an entire strip it possessed "a peculiar value for railway purposes" and this seems to have been an important element in making up the valuation. The Supreme Court dismisses this theory of railroad valuation as absolutely unjustified. The Court says:

> The evidence demonstrates that the appraisements of the St. Paul and Minneapolis property were in substance appraisals of what was considered to be the peculiar value of the railroad right-of-way. The railway right-of-way was conceived to be a property sui generis, a large body of land in a continuous ownership representing one of the highest uses of property and possessing an exceptional value. . . .
>
> We hold that it was error to base the estimates of value of the right-of-way, yards and terminals upon the so called "railway value" of the property. The company would certainly have no ground for complaint if it were allowed a value for these lands equal to a fair average market value of similar land in the vicinity without additions by the use of multipliers or otherwise to cover hypothetical outlays. We also think it was error to add to the amount taken as the present value of the lands the further sums, calculated on that value, embraced in the items of engineering, superintendence, legal expense, contingencies and interest during construction.

The Supreme Court further attacks the valuation accepted by the lower courts on the ground that no deduction was made for depreciation. The lower courts defended their omission to make any allowance for depreci-

ation on the ground that depreciation was more than offset by appreciation, that the roadbed was constantly increasing in value, that it becomes solidified, embankments and slopes become settled and stable and that a large part of the depreciation is taken care of by constant repairs, renewals and replacements. The Supreme Court holds that such a rough-and-ready treatment of the matter of depreciation cannot be approved. It says:

> When an estimated value is made on the basis of reproduction new, the extent of existing depreciation should be shown and deducted.

We believe these rulings of the Supreme Court are of great importance in connection with the work of railway valuation now being undertaken. It should be understood that in the Railway Valuation Act, Congress has not fixed any standard whatever on which railway rates may be based. It has simply ordered that an appraisal be made and it has required that both the original cost of the road according to the available records and the cost of its reproduction new shall be determined, together with allowances for depreciation.

In view of the above quoted Supreme Court decision, however, it is clear that the Federal Constitution protects the holders of railway investments from capricious legislation by Congress as well as by the States, tending to confiscate the value of their property. Not only would any attempt to determine the present valuation of a public utility property on the basis of original investment break down of its own weight, but the Supreme Court is now on record as disapproving of this as a sound basis for reasonable rates. The basis of valuation to which the court has now given its approval is "the cost of reproduction new." In many cases the lands and other property owned by the railway have increased in value so that they are now worth ten or twenty times what they originally cost. That is an increment of value which belongs to the owners of the railway just as much as a similar increment in value belongs to any other owners of real estate.

On the other hand, however, rails, rolling stock, buildings, bridges and other property which were bought or constructed many years ago and which have deteriorated in value are to be appraised, not at what they originally cost, but at what they are worth at the present time. Thus far, at least, the recent Supreme Court decision appears to lay a sound foundation for the work of the staff of valuation engineers.

LETTERS TO THE EDITOR

Careful Tamping an Important Factor in Levee Building

Sir—Your editorial in a recent issue entitled, "Wanted: Machinery for Levee Building," makes mention of the possibility of using the cable drag scraper in the construction of river levees. This appears to be about the only machinery equipment now extant having sufficient working radius for the heaviest work, though many sections of the Mississippi system, especially in the lower valley, have been constructed by self-propelling drag-line machines equipped with rather unusually long booms. It is doubtful, however, if we should take it for granted that the day of the drag scraper and mule is entirely past, for this method of levee building has certain advantages over the faster but not always cheaper machinery method.

In April, 1911, the writer witnessed a short but plucky fight against what looked to be a certain crevasse at the Myrtle Grove plantation. The river was not excessively high at that time, but a long continued gale, blowing in line with one of the longest reaches of the lower river had caused the waves to batter down the timber revetment at the angle at Myrtle Grove, and the wash soon cut away the narrow banquette and the front slope of the levee. In spite of the fact that a large force of men was working under most efficient leadership, it was not until the waves had cut entirely through the crown of the levee that the water was checked by the solid material which formed the back slope.

Col. Wilkinson, President of the Myrtle Grove Plantation Co. was in personal charge of the work and stated that the original levee at this point was built by mules and scrapers and was later increased in height and thickness by a dredge which was operated along the banquette. In spite of the severe storm, it was easy to see the line of demarkation between the material that had been compacted by the teams and that which had been placed without this tamping. As the waves cut into the front of the levee, there was usually a break at the junction of the two pieces of work.

There was nothing to indicate, however, that the later work had been done carelessly or with inferior material. In fact, there was no choice of material, nothing but the deposits on the banquette being available. While the force of the waves would undoubtedly have cut through the more solid material had it not been protected as quickly as possible, it is certain that no possible effort on the part of the local forces could have prevented a crevasse if the entire levee section had been as friable as that in the front.

Quite similar conditions existed at the Poydras break of this year. The entire front and crown of the levee was destroyed and a considerable current was running over the top of the remaining portion when the local plantation forces and the construction gang of the Phillips Land Co. saved the situation. The section of this levee was made up the same as that at Myrtle Grove. The portion destroyed would have gone out regardless of whether it was solid material, as the break was evidently due to undercutting; but if the material in the rear portion of the levee had not been well packed, it would not have withstood the erosion of the considerable flow that passed over the top for some time before it could be stopped. This break occurred at the time when the river was nearly at its maximum height and if it had not been

stopped, the loss would undoubtedly have been tremendous.

The levee which is built by machinery or by wheelbarrows is sufficient under favorable conditions if properly constructed; but it will not stand up against unusual currents as will the levee that is built by the team and scraper method. It would probably be impossible to get together team outfits that could handle the material that should be placed in the Mississippi River levees in the next few years; but it is probable that the advantages of more substantial levees would justify an extra expense in special instances where conditions are favorable for team work or where exposure to erosion is specially severe.

A. M. SHAW.

New Orleans, La., June 10, 1913.

[The advantage of thorough compacting of a levee embankment is well set forth by our correspondent. We may point out, however, that material placed by cars or drag scrapers may be compacted by rolling with grooved rollers as is commonly done in earth dam construction.—ED.]

Machinery for Levee Building

Sir—Referring to the editorial in your issue of June 5, "Wanted—Machinery for Levee Building," the statement that practically all the levees on the Mississippi River have been built by either hand power or horse power is misleading. At the present time there are engaged in levee building on the Mississippi, a large number of most efficient earth-handling machines such as drag-line scrapers, orange-peel excavators, gasoline-driven loaders, etc.

Articles frequently appear in the public press urging the use on levee building of the plant now engaged in the construction of the Panama Canal, on the assumption that with these machines levees could be built for a much lower cost than that at which they are now being built with present appliances. That this impression is erroneous, the following figures will, I think, show.

The Fourth District, Mississippi River Commission, New Orleans, purchased in 1908 a McMyler Levee Building machine with 74-ft. boom operating a 2-yd. bucket in certain classes of material, and in others a 2½-yd. bucket. Since the purchase of this machine it has constructed 709,255 yards of earthwork at a cost of $83,068, or about 11.712c. per cu.yd., including all charges for repairs, maintenance, operation, depreciation, interest, superintendence and proportional share of office expenses. During this same period the average cost of work done by contract under this office, considering the contract price only without other overhead expenses, has been 21.66c. per cu.yd.

From the above figures it will be seen that any other machinery proposed for levee building work, either that at Panama or elsewhere must be of a very efficient type in order to compete successfully with the machinery now in use under this office. The general public imagines that the levees can be built most economically with steam shovels such as are used at Panama; but a steam shovel can only be used in levee building when operated in connection with cars, engines and railroad tracks; and inasmuch as the earth to be moved is in nearly all cases taken from the immediate front of the levee to be built, the impracticability of the steam shovel is evident. There are certain cases, however, in which steam shovels and railroad equipment can be used to advantage, notably in the closure of crevasses where material must be hauled for considerable distances.

What is most urgently needed for levee building along the Mississippi River, especially above Old River where the specifications require a very wide, flat pit and where the levees are so large of section that drag-line and orange-peel machines are not adapted to the work, is some form of machine capable of excavating material and conveying it two or three hundred feet at one operation.

For and in the absence of C. O. Sherrill, Captain of Engineers, U. S. A

J. D. SCHMIDT, Chief Clerk.

New Orleans, La., June 17, 1913.

Concerning Advertising by Engineering Schools

Sir—I received a few days ago a bulletin from Harvard University describing the courses of study in sanitary engineering. It is fine reading and makes older engineers envious of the young men who can attend such schools and receive the benefit of the instruction there given. On page 16 appears the following:

> The sanitary specialist needs extensive laboratory experience and practice in research, while the engineer needs to work with his surveying instrument, his drafting board and the other tools of his profession. The demand for young sanitary engineers is continuous and increasing. There is little doubt but that men who enter this field will find useful service and a competent livelihood.

Your attention is called to the second and third sentences in the above paragraph. Is it necessary for an institution of such high standing and so well known to advertise in this way to attract students? Can the statements made be substantiated? It is well known that the demand for *young* men trained in engineering schools is fairly good, no matter what specialty they took in school. So is the demand for *young* stenographers and bookkeepers. The reasons are the same in all cases, the fact being that in all work of a clerical, or semi-clerical nature, the beginner is nearly always assured of temporary employment at least.

My observation has been that as a specialty to pursue in school, sanitary, and municipal engineering generally, can hardly be so well recommended as structural engineering. The majority of engineers in private practice in Chicago are engaged in structural work and some of them employ a considerable office staff. The few engineers who specialize in sanitary and municipal work do not employ so many men and the work is more fluctuating. I know that the average pay is better in the offices of structural engineers.

Young men come into my office almost every day seeking employment and they represent first-class schools in all parts of the country, but especially schools in the vicinity of Boston and New York. Those most dissatisfied with conditions of employment and pay are the young men who took highly specialized courses, especially in sanitary work. In large cities positions are gained through civil service examinations and in smaller municipalities the city engineer and his staff are the prey of politics. It is not dignified for a university like Harvard to make statements calculated to attract young men toward a certain line of study with assurances as to their

earning power. It should be sufficient to establish a first-class course of study and let it be known. To make statements to the effect that a demand exists for men in any line of work smacks of the methods of business colleges.

ERNEST MCCULLOUGH.

Chicago, Mar. 20, 1913.

NOTES AND QUERIES

F. H. J., Roxbury, Mass., writes:

I should like to ascertain from the experience of other engineers expressed through your valuable columns if the process of grouting the bed of an artificial pond having a sand and gravel bottom was ever successfully practiced as a method of preventing excessive leaching of the water through the bottom, and if accomplished what were the methods used and the approximate cost?

The proposition in question is the prevention of excessive leaching in a shallow reservoir situated on a gravelly plateau which is to be used for storage of water for irrigation. The area of the reservoir is to be four to five acres.

Annual Convention of the Master Car Builders Association

The 47th annual convention was held at Atlantic City, N. J., June 16 to 18, closely following that of the Master Mechanics Association (reported in our issue of June 19), and with an attendance comprising very many of those who were present at the former convention. The meetings were held in the assembly room on Young's Pier, and on this pier was the extensive exhibit of railway equipment, material and appliances which is such a striking feature of these allied conventions.

At the opening session on June 16, the annual address was delivered by the President, C. E. Fuller (Union Pacific Ry.). This dealt largely with matters relating to car interchange and matters touched upon in the various committee reports. He urged caution in making recommendations for improvements in car construction and car service. While such improvements are important and in the main necessary, the association should carefully consider whether they may unduly increase the cost of car operation and maintenance. The report of the Secretary, Joseph W. Taylor (Chicago) showed that the total membership is 879, and that the total number of cars represented is 2,713,650.

CAR COUPLERS AND DRAFT GEAR

The car coupler is again in a stage of development, owing to the variations and special features which have been introduced in the too numerous designs, though all of the designs conform to the standard contours of coupling parts. The number and variety of couplers are causing increasing trouble, but as these special features are covered by patents, there are difficulties in arriving at a uniform standard design. The Committee on Coupler and Draft Equipment was instructed last year to proceed with the design of an M. C. B. standard coupler, working in conjunction with the manufacturers and using as few as possible of the patents now in force. The committee's report consisted mainly of descriptions of an extended series of tests and a review of the proceedings of several meetings held by the committee jointly with representatives of the manufacturers. The conclusions arrived at are that the present coupler is of inadequate strength, and that the required increase in strength will necessitate increasing the weight of the coupler 30 to 40%.

The committee made an exhibit of designs of couplers embodying the specifications agreed upon by the railway representatives and the manufacturers, the latter having designed the working parts according to their ideas to meet the specifications. From these designs couplers will be selected for service test to determine the strength, the efficiency of operation and the best contour lines, with a view to harmonizing the designs and eliminating details that prove unsatisfactory. It is recommended that until these service tests are made and certain couplers selected for trial, the railways should not apply other new or experimental types of freight couplers.

It was stated that the committee will probably be able to present a design for a standard coupler at the 1914 convention.

CARS AND CAR-DUMPING MACHINES

The increasing use of car dumping or unloading machines (by which the car is tilted in a cradle), for handling coal and ore, etc., has developed special features of damage to cars handled in this way. A committee appointed to investigate the matter stated that the machines are of two types: (1) the floor carrying the track is shifted transversely to bring the car against the side of the cradle; (2) the side of the cradle is moved inward to come in contact with the car. In the first case, the damage occurs when the car is tilted, as it has not a proper bearing, and such parts as hand-holds, ladders, staples and door-operating mechanism are damaged by coming in contact with the cradle. In the second case, damage is done by hydraulic clamps crushing in the sides and bending down the top of the car, while parts of the floor framing outside the rails are likely to strike the column bolts of the trucks.

To prevent such damage, the cradle (in either class of machine) should be faced with 10-in. timbers, spaced far enough apart to allow any loose material to fall through, and cut away at certain points so as to clear projecting appliances on the side of the car and afford a full support to the car when the cradle is tilted. On machines of the second class, care must be taken also to provide against the present excessive pressures. Railways should see that these remedies are applied to car dumpers at steel works, etc. In designing new cars, consideration should be given to the possibility of their use on car-dumping machines. Other machines and appliances used in loading and unloading cars will be considered in a later report.

In the discussion, several speakers referred to their experience with cars damaged in this way. In the discussion on car trucks, also, it was stated that the tilting of cars in these machines disturbs the bearing so that the waste in the journal boxes is likely to get into the bearings and cause the cars to develop hot-boxes.

STEEL FREIGHT CARS

A rather surprising matter brought out by the Committee on Car Construction was the lack of strength in some new steel cars. This was substantiated by several speakers who recorded their experience with such cars, many of which sustain damage in ordinary road and yard service. Under a rule relating to car repairs it is as-

sumed that an all-steel car or a car with steel underframe is strong enough not to be damaged in fair usage, and consequently the handling road is made responsible for the cost of repairs. But it appears that in some recent designs the center-sill section has been so reduced (to save weight and first cost) that the cars are no stronger than (if as strong as) the wooden cars. Yet under the above rule, the owner is protected against repair expenses, which is manifestly unfair.

The committee recommended that existing steel or steel-underframe cars that do not meet the following requirements should be classed with wood cars and subject to the same rules of repairs: (1) cross-sectional area of center sills should be not less than 16 sq.in.; (2) ratio of stress to end strain not less than 0.09; (3) the length of center or draft sill members, or part of member between braces, to be not more than 20 times the depth of the member, measured in the direction in which buckling might take place. For new cars, greater strength should be required, in view of the developments in heavier locomotives, rougher handling of cars, etc. For such cars, the sill area should be not less than 24 sq.in., the ratio of stress to end strain not more than 0.06, and the unbraced length as above.

The discussion showed a general opinion that it is time for the Association to take definite action in this matter and specify certain minimum requirements. The committee's recommendations will be submitted to letter ballot.

Box Cars

The report of the Committee on Car Construction stated that an investigation of repairs to box cars indicates that wood ends without reinforcement are not strong enough for present conditions. Metal ends and metal reinforcement have been found satisfactory. The committee recommended that the ends should be reinforced with steel plates and cross braces on wood cars, and with braces on steel-underframe cars. New cars should have steel ends, and such ends should be applied also to cars with wood superstructure requiring complete renewal of ends.

End doors in box cars are causing trouble from the difficulty and danger of sealing them and inspecting the seals. Some roads are now omitting them from new cars, and nailing them up on the old cars. They are only required on roads handling long lumber in comparatively short cars, and will become obsolete with the advent of the 40-ft. box car. If used, they should be made to lock automatically when closed, with a lock accessible only from the inside, thus avoiding the necessity of seal records. Seal appliances should be accessible from the ground or from the end ladder.

One member pointed out that in ventilated cars for fruit and vegetables end doors are required at top and bottom for ventilation. And as these doors have to be open for part of the trip and closed for the rest of the trip (to regulate the ventilation according to the change of climate) they cannot be made to lock automatically on the inside. Mr. Hennessey (C. M. & St. P. Ry.) referred to the end doors of automobile cars, which form practically the entire end of the car. The committee saw no reason why these should not lock automatically on the inside when closed, in which case seals would be required only on the side doors. However, it was evident that the committee had been considering lumber more especially in regard to end doors.

The Committee on Inspection of Box Cars referred to the necessity of inspecting cars before loading them, with special classes of freight, to avoid claims for damage to freight due to leaky roofs, dirty floors, projecting rails, etc. The practice of several roads in this respect was described. Several members thought this a matter for the operating department, and it was decided to refer it to the American Railway Association, which originally requested its consideration.

Tank Cars and Refrigerator Cars

This committee report related to special designs of cars for carrying special fluids, such as liquified chlorine gas, liquified petroleum gas, bisulphide of carbon, sulphuric acid, and ammonia solutions. It presented also some minor changes in the present specifications for tank cars. As to the tests of these cars and their safety valves, the committee recommends that a certified record of the tests should be filed with the U. S. Bureau of Explosives, owing to the importance of such records in case of lawsuits relating to damages. The report was approved, and it was decided to see if the plan of piling records of tests would meet the approval of the Bureau of Explosives.

The question of preventing damage from brine droppings from refrigerator cars has been a problem for both the engineering and the mechanical departments of railways. The private car companies have agreed to equip these cars with tanks to retain the brine, instead of allowing it to drip upon the track. At the special meeting to consider the rules of interchange, representatives of these companies protested that the M. C. B. Association has not allowed time enough for making the necessary changes. The working out of the details has been left to the companies, and they have tested different devices, many of which have proved unsatisfactory. In addition, the changes involve considerable expense. They asked that the date for having all cars equipped be extended from Sept. 1, 1914, to Sept. 1, 1916, but it was decided to extend it only to 1915.

Freight Cars of Light Capacity

A matter submitted for topical discussion was the advisability of withdrawing from interchange service all cars of 40,000 and 50,000 lb. capacity, and restricting their use to their owning lines. This developed a very brisk discussion with opinions about equally divided. Mr. Hennessey (C., M. & St. P. Ry.) and Mr. Schroyer (C. & N. W. Ry.) objected strongly to the proposition, claiming that many of the light-capacity cars are as strong as, if not stronger than, many of the larger modern cars of high capacity. Also, that railways are bringing these cars up to the requirements of modern train and yard service, and that it would be a very serious matter to require roads having many such cars to withdraw them from interchange service.

On the other hand, Mr. Crawford (Pennsylvania Lines), Mr. Barnum (B. & O. R.R.) and Mr. MacBain (L. S. & M. S. Ry.) thought that in general the light-capacity cars mixed with high-capacity cars are a menace to the safety of trains, and that it is very poor economy to try and put these old cars in condition to meet modern operating requirements. Mr. Gaines (C. of Ga. R. R.) said that when his road receives a car of less than

60,000 lb. capacity it transfers the load to another car, believing this to be more economical than to handle the light car.

Another member approved of the idea, but thought it outside the province of the Association, and that the matter should be taken up with the higher officials, or referred to the American Railway Association for its opinion in the matter. Mr. MacBain (L. S. & M. S. Ry.) remarked that while his road aims to keep its own equipment in good condition, 47% of the cars on its lines are "foreign" cars, and some 80% of the draft-gear failures occur in these foreign cars. Other speakers referred to similar experiences. It was voted to appoint a committee to make inquiry as to the number of light-capacity cars on individual railways, with a view to submitting to the American Railway Association the proposal to prohibit the use of these cars in interchange traffic after 1914.

Trucks, Wheels and Axles

The Committee on Car Trucks presented a report of progress as to the design of cast-steel truck frames and bolsters for cars of 80,000 to 140,000 lb. capacity, and expects to be able to submit a design for the bolster next year. It is making tests also of arch-bar frames. Another committee has to deal with specifications for cast-steel frames and bolsters, but has not been able to make its proposed tests. It was suggested that the two committees should work together. It has been claimed that under emergency applications of the quick-acting brake, there have been cases of axle failures and a tendency of the journal to roll out under the edge of the bearings. To avoid this trouble on passenger cars, the brakeshoe may be lowered or clasp brakes may be used, but the latter are too expensive for tenders or freight cars. It was suggested that it might be desirable to remedy the trouble by altering the depth of the journal bearing.

The Committee on Car Wheels submitted additions to the specifications (adopted last year) for wrought-steel wheels, and these will be submitted to letter ballot, except that the proposed limits for segregation will be omitted. The specifications provide for openhearth steel, and for chemical composition as follows:

	Acid Steel	Basic Steel
Carbon	0.60 to 0.80	0.65 to 0.85
Manganese	0.55 to 0.80	0.55 to 0.80
Silicon	0.15 to 0.35	0.10 to 0.30
Phos. and sulphur (each)	max. 0.05	max. 0.05

The discussion brought up the question of shape of wheel tread, and Mr. Garstang (C., C., C. & St. L. Ry.) referred to a suggestion of P. H. Dudley (New York Central Lines) that the present taper of 1 in 20 be changed to 1 in 38, to prevent carrying an excessive proportion of the load on the inner side of the rail head. He referred also to the request of the makers of cast-iron wheels that in wheels for high-capacity cars they should be allowed to increase the thickness of the flange by 1/8 in. (the metal to be added on the back of the flange). The objection to this is the probable interference of the thicker flange (when the wheel tread is worn) with the flangeway of frogs, switches, guard rails and crossings. The present prescribed width of flangeway is 1¾ in., and a motion was carried to request the American Railway Association to consider increasing this to 1⅞ in. to accommodate the thicker wheel flanges. This is a matter in which the maintenance-of-way department should be consulted before any definite decision is made, although the discussion included no reference to this side of the question.

As to the taper of the tread of the wheel, it appears from the discussion that wheels of different taper are being tried (with diverse results) while at least two roads have tried cylindrical treads. On the Lake Shore & Michigan Southern Ry. the results were unsatisfactory, while on the Chicago, Milwaukee & St. Paul Ry. they were satisfactory. The plan was abandoned, however, on this latter road, the standard form of wheel tread being adopted for the sake of uniformity.

Air-Brake Equipment

The report of the Committee on Brake Shoes and Brake Beams, presented by Prof. Benjamin (Purdue University), recommended further tests on the shoes tested in 1910, in order to furnish data for high-pressure specifications, these tests to be made at a speed of 65 m.p.h. and at pressures of 9000 to 12,000 lb. It also recommended: (1) a standard spacing of 60 in. (instead of 60¼ in.) for brake-beam heads, as the latter allows the brake-beam to shift; (2) the consideration of a specification for a brake-beam for passenger cars. It was decided that the brake-shoe tests should be continued as suggested, and that the two recommendations should be approved, although there was some objection to the first. The report presented in an appendix the results of the brake-shoe tests made at the laboratory of the American Brake-Shoe & Foundry Co., by the New York Central R.R.

The discussion developed the fact that a proposed recommendation as to the brake heads involves certain patents, and this question will be considered by the Executive Committee before sending out the recommendation for ballot.

The Committee on Air-Brake Hose submitted specifications and recommended the discontinuance of both the labels now used. The calendar label, which is intended to show the dates of application and renewal, is seldom used; the label indicating that the hose is M. C. B. standard involves unnecessary expense. A single label of new pattern was recommended, but quite a different label was proposed by the Committee on Train Brake and Signal Equipment. This latter was withdrawn, however, and the questions of adopting the new specifications for hose, the new label, and a specification for gaskets, will be submitted to letter ballot.

This latter committee presented other recommendations as follows: (1) all freight cars weighing 37,000 to 58,000 lb. to have 10-in. brake cylinders, the braking power to be 60% of the light weight of car (based on 50 lb. per sq.in. cylinder pressure), and a total leverage ratio of 9 to 1 not to be exceeded with the above cylinder and pressure; (2) a standard triple valve for all freight cars is desirable, and the K-1 and K-2 are recommended for 8-in. and 10-in. equipments; (3) on account of the increased weight and length of passenger trains, no brake pipes less than 1-in. diameter should be used, and new equipment should have 1¼-in. pipe; (4) the ends of the brake pipe should be supported by swinging clamps and hangers, so that there will be no trouble from hose parting while a train is passing through crossovers or sharp curves; (5) galvanized pipes and fittings should be used on coal and refrigerator cars to prevent corrosion by acids and brine.

Mr. Schroyer (Chicago & Northwestern Ry.) objected to the limitation of the present 8-in. brake cylinders to cars of less than 37,000 lb. weight, as imposing undue expense for new material and the scrapping of material which is still good. This view was not supported, however, and it seemed to be the general opinion that modern trains and train service demand the use of the 10-in. cylinder. The report was accepted, except as to its recommendation of a label for brake hose (noted above).

Car Heating and Lighting

The Committee on Train Pipe and Connections for Steam Heat presented specifications for steam-heat hose and couplings. Last year its specifications for hose were rejected. For the coupler it preferred the medium to the large size, as there is so little difference in the openings that it does not affect the passage of steam through the train line. The Committee on Train Lighting submitted the following: (1) designs for car axles for the application of pulleys from which dynamos are driven; (2) general design for axle-dynamo suspension, providing a minimum clearance of 6 in. above the rail and 3½ in. from any mechanism attached to the car body; (3) a standard design for battery boxes on cars.

Car Interchange

The rules affecting the handling and repair of cars (railway and private) in interchange between various railways are of great importance as affecting the facility of through traffic. As noted already, a special session was devoted to the consideration of proposed revisions in the rules of interchange, such as are presented annually. The meeting was a very protracted and animated one. The discussion was mainly in regard to the relation of the revised rules to private or non-railway cars, the representatives of which claimed that they would be affected adversely. After extended discussion, however, the revisions were adopted practically as suggested by the committee.

The abuse of the repair card and the billing of the railways of excessive repair costs were discussed, and while some speakers thought that such trouble existed (due perhaps to the repair-men not having full knowledge of the cost of repairs), others thought that such controversies simply waste time. There is no question of dishonesty, and if railways will build cars well and see that they keep them in proper repair they need not fear excessive bills. The Committee on Prices for Labor and Material submitted certain changes in the prices allowed for repair work, and these were adopted, with the exception of certain allowances for depreciation.

Miscellaneous

The Committee on Revision of Specifications submitted suggestions for securing uniformity in style of the various specifications, on the line of the standard adopted by the American Society for Testing Materials. Supplementing this, it submitted a number of the present specifications revised as to style and wording. The committee recommended also that the specifications for wrought-iron axles be discontinued, as material of this kind is no longer purchased in large quantities. There was some objection to this, as when the same suggestion was made at the Master Mechanics convention, but the matter will go to letter ballot. The Committee on Revision of Standards presented a number of minor changes. The Committee on Safety Appliances made a brief report as to the work of the railways in meeting the requirements of the new law, and was instructed to inquire as to the possibility of getting an extension of time for the application of certain appliances. The Committee on Rules for Loading Long Material submitted some changes in the rules, including the loading of such flexible material as long steel plates extending over three cars (flats or gondolas). Its rules related also to the loading of machinery and automobiles.

Officers

The election of officers resulted as follows: President, M. K. Barnum, General Mechanical Engineer, Baltimore & Ohio R.R.; Vice-Presidents, D. F. Crawford, Pennsylvania Lines; D. R. MacBain, Lake Shore & Michigan Southern Ry.; and R. W. Burnett, Canadian Pacific Ry.; Treasurer, J. S. Lentz, Lehigh Valley R.R. The Secretary is Joseph W. Taylor, Chicago.

Annual Convention of the American Society of Civil Engineers

The annual convention of the American Society of Civil Engineers was held at the Chateau Laurier at Ottawa, Canada, June 17 to 20. The attendance was fair, but not large. The features of the convention were the presidential address, a discussion of proposed amendments to the Constitution of the Society, illustrated addresses on Canadian Engineering and various receptions and rides about the city, the whole followed by a trip to Montreal on June 20, and an inspection of the Montreal Harbor. The Ottawa members of the Canadian Society of Civil Engineers entertained at lunch and gave an evening reception. A garden party was given by Past-President Thos. C. Keefer and a tea by Mr. and Mrs. Collingwood Schreiber.

The address of the President, George F. Swain, of Harvard University, was a scholarly, but virile consideration of some of the leading social tendencies and problems of the present day, and of the duties of the engineering profession toward them and suggestions as to the part the Society might and should take in correcting evil tendencies and solving social problems. An abstract of the address appears elsewhere in this issue.

The subjects of the addresses on Canadian Engineering work, all illustrated by lantern slides, were: "Canadian Water Transportation," by C. R. Coutlee, Engineer-in-charge of the Upper Ottawa Storage branch of the Public Works Department; "Railway Transportation," by R. F. Uniacke, chief bridge engineer of the Transcontinental Railway; "Water Powers of Canada," by J. B. Challies, Superintendent of Water Power, Interior Department; and the Toronto Harbor and Park Improvements, by Mr. Molliter, of the Toronto Harbor Commission.

Proposed Constitutional Amendments

Two groups of amendments to the Constitution came automatically before the convention, for amendment or for reference to a committee before the amendments go to letter ballot. The first group related to the status of the Secretary; the second, proposed to increase the

number of geographical districts from 7 to 13 and to prescribe that in addition to five past-presidents the nominating committee (now appointed by the Board of Direction) be elected, one from each of the 13 proposed districts. The first group of amendments would alter Articles V and VI and the second group Article VII of the Constitution. The amendments, however, were taken up in reverse order, thus reserving a consideration of the status of the Secretary to the last place.

No amendments were made to the amendment designed to increase the number of districts from 7 to 13, so that amendment, we understand, will go to letter ballot. The proposition to elect the nominating committee by districts led to the random discussion and parliamentary tangle, which generally occurs when a constitutional amendment comes before a meeting of the Society.

On motion of Allen Hazen the tangle was finally referred to a committee of five, to be appointed by the chair, and to report at the January business meeting.

This group of amendments, having been disposed of in two batches, the other group, altering the status of the Secretary, was taken up. At this juncture the Secretary read a letter of protest against both groups of amendments. This protest, which was distributed in printed form, was signed by 762 members, of whom 64 were now or had once been members of the Board of Direction. Of the whole 762 protestants, 358 are in the resident district (New York and vicinity) and 404 are nonresidents, "widely distributed."

On motion of Past-President, John A. Bensel, this group of amendments was also referred to the committee already provided for.

We reprint the letter of protest in full, but without the signatures:

To the Business Meeting of the Annual Convention, American Society of Civil Engineers:

Under date of Apr. 30, 1913, several proposed amendments to the Constitution of the Society were sent in regular course to the members. They consist of two groups, one of which changes the status of the Secretary by removing him as a member of the Board of Direction, and adds other details as to the method by which he shall be elected; the other changes and fixes the details of the procedure for electing members of the Nominating Committee, and incorporates these details in the Constitution, taking them out of the hands of the Board of Direction, and the final action away from the annual meeting.

The undersigned believe the adoption of these amendments inimical to the best interests of the Society for the following reasons:

1. No amendment to the Constitution should be adopted, or even proposed, unless there is some necessity for it.

2. The first group, if adopted, will lessen the importance of the office of Secretary. If it is intended that the Secretary shall be only a clerk, why should he be required to be a Corporate Member of the Society?

Under the requirements of the Constitution, which the proposed amendment does not change, the Secretary is the Executive Officer of the Society, and, as such, must represent it as other scientific, governmental and secular organizations are represented. He is required also to be a correspondent, a librarian, a house and office manager, an editor, a publisher, an accounting officer, and the everyday representative of the Society. His duties must be performed with care and thoroughness, and he must have executive capacity and good business judgment, as well as literary ability and familiarity with the broad field of Engineering.

3. As long as these are the requirements of the position it is evident that the Secretary should continue to be a member of the Board of Direction, as he has been since the organization of the Society.

Prior to 1895 the Secretary was elected by the membership. This method proving unsatisfactory a change was made, and, beginning with that year, the Secretary has been elected by the Board of Direction. The present Secretary was the first elected under this rule, and has since been re-elected annually. This continuity of service has been of great value to the Society as is evidenced by the annual reports of the board during this period. As the board is entrusted with the management of the affairs of the Society, and is largely dependent on the efficiency of the Secretary, there can be no question but that the present method of election is based on sound business considerations. The approval of the Board of the conduct of the business of the Society at the present time is evidenced by a report of the present Finance Committee published in the April, 1913, number of "Proceedings."

The other group of amendments proposes to incorporate in the Constitution a fixed method of election of members of the nominating committee.

1. By the present method, suggestions received from the various geographical districts are presented to the annual meeting, and that meeting appoints the committee. The details of securing these suggestions are in the hands of the Board of Direction. It is now proposed that instead of receiving suggestions, ballots be issued, said ballots to be canvassed by the Board of Direction, and the result reported to the annual meeting.

2. In the past it is believed that the suggestions received have not in many cases reflected the sentiments of a majority of the members in each district, and that under the proposed amendment it may happen that a very few members in a district may thus name a member of the nominating committee.

3. There have also been some indications in recent years of the use of log-rolling methods in the selection of members of this committee, and the power now reserved to the Society in annual meeting may be useful to correct this growing evil.

4. It is poor policy to put details of this kind into the Constitution, and the present procedure should be considered as under trial, and the Board of Direction should be left free to improve it as need arises.

We therefore recommend to the membership that these amendments, which, under the Constitution, must be issued for letter-ballot, be defeated.

The only particularly significant point in the amendments affecting the Secretary which have not been brought out here are that under the proposed amendment the salaries of the Secretary and Treasurer would be fixed by ballot by a majority of the whole Board of Direction, whereas now the Constitution merely provides that the salaries shall be "determined by the Board of Direction." [It appears that when the salary of the Secretary was last increased (recently, from $10,000 to $12,000 a year) that the vote of the Board was actually taken by letter ballot (15 to 14), although not required by the Constitution.]

Other Business

The report of the Board of Direction covered a number of interesting points. The Board recommended that hereafter the author of each paper to be presented to the Society shall submit with the paper a digest of its contents and a summary of conclusions. Every author of a paper is urged to present his paper in person, or else to give 30 days' notice that he will not do so, and in that event to choose someone to read the paper for him. Authors are also urged to suggest persons to discuss their papers. A grouping of papers by subjects is suggested. Hereafter lantern slides will be made at the expense of the Society.

Acting on recommendations submitted to it, the Board of Direction voted on June 4 to appoint committees, of five each, on Uniform Water Laws and on Floods, and against creating a committee on Ideal Building Codes for American Cities.

The Board has under consideration the appointment of a Committee on Rails, to act jointly with the American Railway Engineering Association.

The business meeting referred to the Board of Direction a communication asking whether the Society

should approve or disapprove propositions for the regulation of engineers and for other schemes designed to improve the status of the engineer.

The Secretary announced that Col. Geo. W. Goethals has agreed to accept the presidency of the International Engineering Conference, to be held at San Francisco, in 1915. The Secretary also announced that the canvass for suggestions for the next summer convention of the Society had shown Chicago to stand first on the list *with a grand total of 43 votes.*

Some Tendencies and Problems of the Present Day and the Relation of the Engineer Thereto*

BY GEORGE FILLMORE SWAIN†

We are living in a most remarkable age, an age different from any that has preceded it in the history of the world, and one in which changes are taking place with marvelous rapidity. As a profession, we are largely responsible for the present conditions, and as such we should do our part in solving such problems as exist, and in helping to direct aright the tendencies of the day. We have a duty to ourselves, to our profession, to society, and to our successors, and we must perform it.

We have been often reminded of the fact that in one sense engineering is the oldest of the professions, since engineering constructions of some form are necessary even in the rudest communities. But in another, and perhaps a truer sense, it is the youngest of the professions.

Civilization, as we know it today, then, seems to me to be due mainly to the engineer, or applied scientist, using the term in its widest sense. Of course, a great ethical advance has also been made, of which any student of history must be fully conscious. But when we consider that moral principles were known and recognized by the ancients, in as perfect a form as that in which they can be stated today, without producing much of any widespread ethical progress or any advance in civilization for many centuries, we must, I think, conclude that it is the dissemination of intelligence, the facilities for transportation, the development of machinery, which have made the whole world kin, and thus have been the chief elements in promoting the universal brotherhood of man and the practical recognition of human rights, and so have been the main agents in the progress of civilization.

The political and social evolution in the past has up to a comparatively recent period, not involved any diminution of the incentive to individual effort, nor to any great extent the attempt to deprive the individual of the fruits of his industry and ability. Of late years, however, with growing political power in the hands of the less intelligent classes, symptoms of a change have shown themselves. The spectacle of isolated instances of great wealth acquired unfairly or too rapidly, and of rewards out of proportion to service, instead of being looked upon as necessary phenomena, seeing that men are human, and that no human affairs can ever be perfect, has led to a widespread spirit of envy and discontent, and sometimes to a desire to deprive men of the results of their honest toil.

It is to some unfavorable phenomena incident to this movement that I wish to call your attention today, believing that if they continue, disaster may result, in which case, as always, the suffering will mainly come upon those least able to bear it.

1. In the first place, let me refer to the tendency to consider men equal, or to what I may term a false democratic ideal.

What I conceive to be the true democratic ideal is this: that all men are equal before the law, so that neither differences in wealth, race, social position, nor talent shall confer any advantage or impose any disadvantage in the impartial administration of justice; that while ability may be admired, every man who is honest, industrious, sober and faithful, and who does his work in the world as well as he can and with due regard to the rights of others, is deserving of equal respect and regard, whether he occupy the humblest or the most exalted position; that success depends upon the spirit with which one's natural endowments are utilized and the degree to which they are developed, and not upon those endowments themselves, so that the humblest laborer on the street may be making as great a success of his life as the most gifted; that there should be kindliness and a spirit of brotherhood between all men and neither envy of those more capable, who receive greater rewards, nor contempt of those less gifted, who do the menial work of the world; and that neither race, poverty, nor inferior social position should prevent the possibility that a man, by hard work, integrity, and conscientiousness should be able to reach, by some available ladder, a position commensurate with his abilities. A man should be judged by what he is, not by what he has, whether he is black or white, or who his grandmother was. He should have the opportunity to get such education as best fits his natural qualifications. Rich and poor should be judged by the same standard—inherent worth. But though respect should be equal, rewards should not be, but should be in proportion to the value of the service, and governed by the law of supply and demand; nor are great rewards necessary for happiness.

Unfortunately, a democratic government, especially with universal suffrage, instead of tending to the realization of this ideal, tends in some respects directly away from it, and leads not seldom to the grossest perversions of it. The equality of man, which the framers of the Declaration of Independence held to be self-evident, instead of being interpreted as above, is held to mean that men are inherently equal in all respects.

It is self-evident that instead of being equal, men are very unequal. There is perhaps more difference between the most intelligent and the least intelligent voter than there is between the latter and an intelligent animal. It is held that all, being equal, should have equal opportunity. But why should there be equality of opportunity for unequal individuals? Inequality of opportunity for unequal men is a nearer approach to true equality than equal opportunity for unequal men. Why, for instance, should all men have opportunity for a college education, when only a few can profit by it, and the great majority should work with their hands, not with their heads? Not every man who is able to pass successfully through a college course is able to use it when he has finished, and many a good mechanic has by its means been spoiled to make a poor and discontented clerk or lawyer.

One of the conditions of individual progress is the willingness to recognize and admire superiority, and without envy to rejoice in its success. The idea of the equality of man limits this recognition, and so hampers individual progress, and therefore collective progress. In college, there is little in class associations to stimulate a man to excel. If he does, he is termed a "grind" and is looked down upon. If all men are equal, he has no right to exhibit any superiority to his fellows. The same is true among the so called laboring classes. No man must do any more work, or do it any better, than another. Individual excellence and initiative are discouraged. Indeed, individual freedom is not seldom infringed upon, and a man is not allowed, at times, to work at wages satisfactory to himself, when he desires to do so—a strange result of freedom, and in reality as great an outrage as any that can be quoted from the mediaeval annals of despotism. With growing discontent, many minds turn to socialism, that impracticable Utopia which, as President Butler has well said, "would wreck the world's efficiency for the purpose of redistributing the world's discontent."

The idea of the equality of man, instead of allowing the best men to govern and fitting the man to the proper vocation, leads to the placing of unfit men in power, the control of large masses of men by demagogues, the judging of men by the number of votes they can control; and thus it leads to the withdrawal of many of the best men from active participation in public affairs, because they see how little influence they can exert, and that the only reward of one who unselfishly serves the public is likely to be criticism and contumely. It also discourages loyal and faithful service, and makes difficult the maintenance of proper relations between employer and employee.

What the ultimate result will be, cannot be foretold. The political doctrine of the equality of man is still on trial. Yet, as regards the United States, where that doctrine has its present expression, Lincoln long ago observed that if it fails, it will not be on account of interference from without, but it will be by suicide. It behooves us, therefore, if we can, to see to it that our institutions shall not fail by suicide.

Nevertheless, it is a somewhat striking fact that several of the most philosophical and learned historians have distrusted the ultimate success of our institutions. Froude, Macaulay and Lecky all express the gravest doubt of the permanence of our form of government.

*Condensed from the annual address before the American Society of Civil Engineers, Ottawa, Canada, June 18, 1913. The portions of the address consisting of "applications" to engineering, the engineer and the American Society of Civil Engineers are given nearly in full, but the review of "Tendencies" is necessarily abbreviated under each of the subheads.

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Unfortunately, it is a vain hope that there will ever be an absence, or even a dearth, of demagogues to stir up this spirit of unworthy discontent, but we should do all in our power to counteract it. Unfortunately, much of it is due to the unwise use of wealth by those who possess it, who think that money can buy everything, and is the end and aim of existence and who, instead of being governed by a feeling of the brotherhood of man, and the spirit of respect for true worth even in the humblest occupations, assume an attitude of superiority, or even of insolence, toward those less fortunate than themselves.

2. The Tendency to Disregard Authority. Out of the tendency to look upon all men as equal, spring some other tendencies to which I will refer. One of them is to disregard authority, and to consider that one man's opinion is as good as that of any other. We see this tendency about us every day; it leads to intellectual arrogance, dogmatism and lawlessness.

Every man has presented to him, almost daily, questions which he is not competent to decide for himself, either because he has not had the necessary time, training or experience, or because he is incapable of judging.

In these days when literature is so superabundant, it is most important to choose our advisers wisely, to know whom to trust, to discern wisdom, to select the proper books to read, to choose the best authorities to whom we shall listen, and, when we have so chosen, to consider attentively the message they bring, and to distinguish advice that springs from self-interest from that which is disinterested. There is a great temptation to form hasty and immature judgments on slight authority; and the habit, once formed, may be difficult to eradicate.

The disregard of authority is peculiarly observable in the younger generation. It is not confined to the uneducated, but is even more observable in many whose self-esteem has been increased by a course in college. Finding that men disagree on almost every subject, and that even those in position of authority do not hold the same opinion, it is easy to conclude that one man's opinion is as good as another's.

It seems to me that if intelligent men differ on any subject, it must be due to one or more of the following causes:

1. One or the other is not in possession of all the facts or principles involved.

2. One or the other may use facts or principles which are incorrect.

3. One or the other may reason incorrectly.

4. One or the other may see the facts out of proportion, attributing too great importance to some and too little to others.

5. One or the other may illustrate the natural stubborness or imperviousness of the human mind.

It is not always clearly recognized that facts cannot always be compared directly, because they cannot be expressed except in incommensurable terms. For instance, if we ask which is the greater, six feet or two meters, there will be no disagreement in the answer; but if we ask which is the more important, 10 feet or $5, or which is more important, truthfulness or beef steak, the reply is not entirely obvious. These are not fanciful illustrations. We are continually obliged to make comparisons between things which have to do with our physical well-being and those which have to do with our moral or spiritual well-being. They are incommensurable, yet they must be compared and an opinion formed from the comparison. In planning a railroad station, for instance, a certain design requires the passengers to walk a certain number of feet, while another design costs more but requires less walking. Here is a comparison which must be made between feet and dollars. In such a case, some will endeavor to express the comparison in commensurable terms. They will compute, perhaps, the value of the shoe leather that would be saved in a year if all the passengers using the station have to walk the given distance less, and compare it with the interest on the additional expenditure. Similarly, the expenditure of millions of dollars is asked for electrification, the advantage urged being the saving of a certain number of minutes each day for each passenger and because the aggregate saving of time in a year, valued at the average annual wage of an individual, amounts to a sum greater than the interest on the cost. Such comparisons are generally made by those who find their judgment unable to deal with the subject in any other way, who cannot compare except by measuring or weighing, as they have been trained or accustomed to do. Yet such persons do not realize that the comparisons they make may be entirely deceptive. Although more rapid transit may render a journey quicker, it does not follow that the time is saved. It may be usefully employed in reading, or in conversation, or in sleep, or in meditation. An additional fifteen minutes spent in going from one's house to one's office, is not necessarily lost; it may be utilized like any other fifteen minutes in the day. Even if spent solely in meditation, it would be most beneficial, for, as Arnold Bennett says, the great defect of the age is the absence of meditation. In such arguments as that for electrification, the mistake is also made of not considering whether the individuals who would make the saving claimed would be the same individuals who would bear the increased cost.

3. The Disregard of Experience—One of the most serious tendencies of the present day, particularly in the United States, a tendency which, like the disregard of authority, seems to result from that to regard men as equal, is the disregard for experience. It is a tendency fraught with great possibilities for evil, which must be recognized by every serious thinker.

In any occupation, except those which have to do with the study of purely abstract relations, which, as above explained, may be arrived at correctly in the seclusion of the study, it is almost self-evident that experience is of great value. In any occupations having to do with pure and applied science, and particularly in those having to do with man and his relations to society—that is to say in politics, economics and government, as well as in engineering—experience is a necessary qualification for arriving at correct judgments. A person having a power of perception of mathematical relations may become a profound mathematician at an early age; indeed, the perception of mathematical truths is essentially a subjective faculty, and may be most correct and powerful when the mind is removed from the objective state. Some mathematical prodigies have reached their greatest power when mere boys, and have lost it with increasing age and contact with the objective world. But, in business affairs, no amount of reading of books or of closet meditation can take the place of actual experience. But, if all men are equal, then the boy's opinion is as good as the man's, and experience is a mere useless drag.

It seems to be an inherent tendency of our form of government to disregard the value of experience; any man is considered good for any job; all he has to do is to get the votes, by one means or another. Men who have made little or no study of government, and who have had no experience in it, are considered capable of judging of and administering laws and of occupying any elective or appointive position. The butcher, the baker, the candlestick maker, are all eligible for the state legislature, for congress, for the senate, for the mayoralty or the presidency. This condition necessarily results in gross inefficiency and waste, not always through evil intent, but perhaps more often through stubbornness, ignorance, conceit or the unwillingness or inability to select and take good advice. Not until our legislators and our administrators of public affairs are chosen from men trained and experienced, and who have ascended from the bottom step by step, will efficiency, economy and wisdom be attained in our government. Whether this time will ever be reached may well be doubted. We are much less advanced in this respect than some of the countries in Europe, where the expert is more recognized and has a higher standing, and where knowledge, and particularly experience, are valued higher than here.

In these days, when higher education is a fad, there is an increasing tendency, in my opinion very pernicious, to regard book knowledge as the equivalent of experience. We are more and more inclined to regard those as able to speak with authority, whose knowledge is derived simply from books, who perhaps have spent their lives in a professorial chair, with no actual experience in the subjects they teach or write about.

Of course, it must not be supposed that experience is everything. In some cases, experience only confirms a man in rule-of-thumb practice, works him deeper and deeper into a rut, and destroys his power of vision. Probably all of us have seen instances of men, whose long experience in doing a particular thing in a particular way has only destroyed their power to see that there is another and a better way, and whose only reason for doing that thing in that way is that they have always done it in that way. Such men, however, would never, under any circumstances, be leaders. They are the soldiers in the ranks, whose only function should be to obey orders. It not infrequently happens, in the administration of some business affair, that a new man with a fresh mind, without experience in that line, but with a power of selecting good advisers, of grasping a new situation quickly, of seeing all the elements involved and of judging them correctly, will arrive at a truer decision than another man of less grasp and judgment, though experienced in the matter in question. This, however, is no argument against experience, but simply illustrates that experience must be combined with grasp and judgment; for the new man, before he becomes really proficient, must either gain his experience, or must be able to select his advisers well and to rely on them.

4. The Tendency to Relax Discipline—Another of the demoralizing tendencies of the equality of man is that which has led in recent years, it seems to me, to the gradual but steady relaxation of discipline. It will probably be denied by few that for the proper training and full development of the human being, discipline is necessary. Life itself is little more than discipline; it is not for pleasure; it is for work, accomplishment, development; without discipline there will be no proper development. He who is born with a golden spoon in his mouth and whose life is a continual round of pleasure, is likely to go out of the world less developed than when he entered it. "The beginning of wisdom," says Solomon, "is the desire of discipline." Work, which is itself an end, and rather to be sought than what it brings, consists largely in doing things which in themselves are uninteresting and perhaps distasteful, and we must accustom and train ourselves to be able to do this kind of work cheerfully and well. This ability will be attained only through discipline. Moreover, the man who attains a position of responsibility must be able to direct and command the work of others, and no one can command wisely until he has first learned how to obey. For this too, discipline is necessary. Yet the tendency of recent years seems to me to have been toward a steady relaxation of the discipline imposed by law and custom upon the growing individual.

A tendency to relax discipline is strikingly shown where its necessity is obvious, namely, in our educational system. Formerly the boy was put through a rigid course of prescribed study, some of it interesting and some uninteresting to him; but all of it, presumably, if the course was properly prepared by a capable faculty, necessary for the end in view. The modern tendency has been to substitute what he chooses to do or likes to do. The result has been, and is, that many young men come out of our colleges with minds and faculties practically wild and undisciplined, without willingness to do as they are told, and without the faculty of concentrating their attention on unpleasant but necessary tasks. But if all men are equal, why should the teacher have the power to impose unpleasant tasks upon the pupil!

5. Another of the tendencies very marked at the present time, is the spirit of innovation, which seems to pervade all things: whatever is, is wrong: the social custom must be changed in order to keep up with the time. This spirit is particularly observable among the young and the immature, especially if it has been preceded or accompanied by a lack of discipline in early training. It is an instance of what Ferrero terms "that youthful spirit of innovation which is in all ages the main source both of perversion and of progress." Many of our young men "all aflame with an enthusiasm unquenched as yet by any continuous contact with affairs," set out to reform the world, not so much because it needs reform, as because they wish to justify their existence. This spirit of innovation is at all times a spirit to be expected and reckoned with. Every generation as it comes along will endeavor to change the condition in which it finds itself, and will designate that change with the name of progress even though it be perversion. Oh! Progress! what crimes are committed in thy name. Even if a social condition were perfect and ideal a new generation would endeavor to change it. Youth desires change; often because it knows no better. Age becomes conservative because it knows by experience the dangers of haste or unwise change. The spirit of equality accelerates this tendency.

This spirit of innovation which pervades all things seems to be largely a result of scientific progress; the rapid advances made in inventions of all kinds, the improvements in the arts and manufacturers, have resulted in a complete revolution of the methods in many branches of industry within a comparatively few years. Men now living were born before there were any railroads, and almost all of us can remember the time when the applications of electricity were just beginning. An industrial plant but a few years old may be out of date and unable to compete with newer and more economical installations. We are accustomed in engineering matters to see things completely remodeled within a short time.

This familiarity with industrial change and the recognition of its benefits has naturally led to the idea that everything must be reconstructed, or it is old-fashioned and out of date, even though it be a thing in which there have been no new discoveries, warranting any change whatever, music, painting, dancing, education—everything, in fact—must be completely reorganized. This willingness and desire for change affords the opportunity for unsuccessful mediocrity and for ambitious and unscrupulous failure to foist upon the public, which eagerly accepts it, forms of change which discerning men must characterize as gross, ridiculous and demoralizing. The result, in many cases, is a deterioration pitiable to behold. Let anyone compare, for instance, the modern painting, dancing and music, with that in vogue fifty or one hundred years ago, and he will find abundant proof of this. In politics and goverment too, the same tendency, the same recklessness, the same demoralization, are equally observable.

6. Advancing civilization and increase of wealth inevitably lead to increased luxury and extravagance; and, with our advancing civilization, this tendency is not wanting. If the experience of the past is of any value, however, it is a serious sympton of degeneration. The sudden accession of great wealth, particularly to those who are incompetent to use it wisely, engenders luxury and ostentation, and a contempt for those less fortunate; thus stimulating, to a certain extent, an attempt of the latter, particularly if endowed with the ballot, to recoup themselves and gain what they conceive to be their rights at the expense of wealth, by various forms of unjust taxation and other well known expedients. If it is our duty to preach the gospel of content and the inequality of man, it is equally our duty to preach the proper use of wealth, and the proper attitude of the wealthy toward those less fortunate; and while believing that individual initiative should be stimulated to the utmost, and allowed to enjoy the fruits of its success, it may, nevertheless, fairly be questioned whether some of the rewards under present conditions are not too large, and whether men would not exert themselves as well for the prospect of a more reasonable recompense as for the prospect of unreasonable and excessive riches. But again history repeats itself, and things move in circles. Peace causes prosperity, prosperity gives rise to wealth, wealth gives rise to luxury and extravagance, luxury and extravagance are the source of contention, contention results in war or social revolution, these result in poverty, poverty results in peace, and so the circle is completed.

7. The last tendency to which I will call attention, is what seems to me the distinct tendency, under present conditions, and in fact, under conditions which have existed in increasing degree as civilization has advanced, toward the deterioration of the race. The law of evolution in all species of animals and plants, the law which we ourselves recognize and follow in breeding and cultivating them, is for the survival of the fittest, the gradual elimination of the weak and unfit. This is distinctly the law of progress. In the case of man, however, there is added an element which does not exist with the lower animals or with plants, namely, the element of human reason. Under the domination of this element, has not the tendency steadily been, with the growth of altruistic ideas and the prevalence of philanthropic institutions, toward the survival of the unfit?

This problem is one of the most serious that confronts us today. I have no time, even had I the knowledge, to discuss it in detail; I will content myself with merely mentioning it. It may seem wrong to believe that all have not equal right to survive, yet it seems to me that the interests of society as a whole must lead us to the conclusion that serious evil, and perhaps ultimate ruin, await us unless some means can be devised for solving this problem and in some manner regulating the perpetuation of our species. If humanitarianism leads to race degeneration, it cannot be the way of progress intended by an all-wise Creator, and we should try to see in what way we are misapplying it.

APPLICATION TO ENGINEERING PROBLEMS

And now you may very likely have asked what has all this to do with engineering, or with the engineering profession; what is the appropriateness of a discussion of social conditions before a society of engineers? My answer is that the engineer is primarily a member of the social body; that its problems are his problems; and that he cannot avoid the responsibility of taking a share in their solution. The problem of the 20th century, it seems to me, will be preëminently, a social problem, and upon its solution will depend the happiness of mankind for years to come. Moreover, this social problem is largely, as I have shown, the outcome of the work of the engineer who, as the advance agent of civilization, has been the main factor in creating the conditions which give birth to this problem.

It will be evident, therefore, that I differ from one of my predecesors who, in his annual address, intimated that social problems were out of the province of the engineer and that he should not meddle with them. On the other hand, I maintain that it is his duty to exert himself in their solution. Moreover, I consider this duty the more necessary because I believe the engineer to be well fitted—possibly better fitted than any one else to solve these problems wisely. Let me briefly give you my reasons for this opinion.

The engineer is by training a scientific man. If this education is what I conceive it should be, and what it will be more and more in the future, it will consist of a training in mathematics, logic, science and in the technical branches of his profession, together with a sufficient amount of study of the humanities—history, economics, language, literature—

to give him a clear view of the relations of things. He will be preëminently by training a scientific man, but with a power of understanding and grasping social questions.

Again, the engineer is a business man, for engineering is business and business is engineering; he deals with men, he has to do with financial affairs, he learns the characteristics of human nature, and his training, therefore, tends to teach him tact, moderation and conservatism.

Of course, any sweeping eulogy or disaparagement of any class of men cannot be truthfully made. Engineers will differ on questions of opinion, as other men will. There are dishonest, untruthful, unreliable engineers, as there are men of this type in every class.

Nevertheless, on the whole, if there is anything in training and experience, may we not believe that engineers, as a class, have the training, temper, and experience which will best enable men to judge sanely and solve wisely the social problems which confront us?

What then, may the engineer do to aid in the solution of the social problems of the 20th Century?

In the first place, he should consider it his duty not to retire into the technical recesses of his professional work and content himself with being the servant of other men, but should actively exert himself and take the initiative in the great problems of the day. He will find that these problems in their details are largely of an engineering character.

What, for instance, is involved in the problem of administering the affairs of a great city? Do they not involve, in the main, the preservation of the health, safety, property and order of the community? and are they not, therefore, predominantly of an engineering character? Financial and legal questions of great importance are, of course, involved, but why should the engineering problems be considered secondary to these? Engineers can employ financiers and lawyers, as well as be employed by the latter. I see no reason why the position of mayor of a city could not be filled at least as satisfactorily by an engineer with proper breadth of view, training and experience, as by a man of any other profession. Yet I doubt if the mayor of any city in the United States is or has been an engineer.

The same holds true of other administrative positions. The management of our great corporations involves problems largely of an engineering nature, and high administrative positions in these concerns are being more and more given to engineers. Even such a position as that of president of a republic is not one which the engineer should necessarily consider himself excluded from. Why is he not as well qualified to fill it as a soldier, a lawyer, or a college professor, provided his training and experience, judgment and breadth of view warrant. Two of our greatest presidents, Washington and Lincoln, while not engineers, did have some little practice in what was then termed engineering, and one president of the French Republic has been a professional government engineer.

There is perhaps a tendency today toward better recognizing the qualifications of the engineer in the administration of municipalities and larger political units. The position of commissioner of public works in a city is perhaps the most important municipal position next to that of mayor. Formerly, this position was monopolized in most cities by men who were mere politicians. Now-a-days, it is quite common to appoint engineers to such posts. In Boston, Philadelphia, Cincinnati, and very likely other cities, these positions are now held by trained and educated engineers, and this recognition I consider significant and deserved.

Engineers, however, will not and should not be recognized in this way unless they show their interest in public questions, unless they inform themselves about them, unless they study the economic and social, as well as the engineering problems involved, and unless they assert themselves before the public. This I trust they will do more and more as years go by. "The fault, dear Brutus, is not in our stars, but in ourselves, that we are underlings."

In education too, where, as I view it, the tendencies I have referred to are plainly evident, we may as a profession exert a good influence. I have often expressed the opinion that an engineering education is the best possible education for any vocation, because it combines, or should combine in the best proportions, the study of abstract relations with that of natural science and of the humanities. These, combined with training and experience in the profession itself, should make the engineer as well educated as any class of men. He should be sane and sensible, not likely to be carried away by fallacious, economic theories; conservative, and yet safely progressive.

Engineers should, I think, exert more influence than they do in education, by actively interesting themselves in it, serving on school committees, and insisting on the maintenance of rigorous discipline and the scientific method. Above all, they should aid in maintaining the standard of engineering education, and prevent it from succumbing to the prevailing tendency to relaxation of discipline. The best students do not really seek such relaxation, and schools which make students work hard and which insist on a high standard of accomplishment, will attract strong men.

Let us make the engineering schools the place of refuge for those who are disgusted with the relaxation of discipline which prevails so largely elsewhere.

APPLICATIONS TO THE AMERICAN SOCIETY OF CIVIL ENGINEERS

Finally, let us inquire what this Society, representing the engineering profession, may do in the directions which have been suggested. We have been criticised in the past as being inactive, as taking no part as a Society in large public questions. I must frankly confess that the criticism has seemed to me in some measure deserved. Our Society is large, rich, influential, but we have been too content to sit down in dignified ease, taking little or no initiative, and allowing other younger societies to outstrip us in actual work performed and in real influence exercised. We have had some committees which have been done good work in unifying practice in relation to technical matters. In these respects, however, we have been far surpassed by two or three of the newer societies, whose committees after long and conscientious labor, have exercised far greater influence than we have in the solution of even professional problems.

It is true that this is largely due to the fact that those Societies are more specialized than ours, that they are composed of men all engaged in one line of work, who could coöperate and lay down the results of experiment, experience and opinion more easily than we could. This Society, however, is the American Society of Civil Engineers, it includes engineers in all branches; there is no reason why the engineers in the different branches should not associate themselves together in sections, or why we could not do more committee work along the various engineering lines than we have done in the past.

I believe, therefore, that we should favor the establishment of branches of the Society in various parts of the country, and of student branches in the several technical schools; and that we should urge our committees to activity, supply them with funds, and perhaps pay the mileage of members who attend meetings. The Society is rich, and it is not a philanthropic institution. If members give their time to committee work, I see no reason why they should be expected to give money, and the expense of attending many meetings may not seldom be considerable.

Moreover, we have been very loath to take any steps in formulating answers to questions which are largely matters of opinion; and we have done, thus far, little or nothing to influence public opinion in regard to questions of the day. I believe that we could and should go much further in these directions; that we should step forward, take the initiative and become a moving force in the community. Let me make some more definite suggestions.

In the first place, I believe we should have a standing Committee of Public Relations, its province being to keep track of all public affairs involving engineering questions directly or indirectly, in all the states in the Union, and to take such action as may be deemed desirable to insure a wise treatment of such questions. This committee might perhaps consist of President and Secretary of the Society ex officio, of a certain number of members of the Board of Direction to be appointed each year by the President, and of a certain number of members of the Society not members of the Board of Direction, to be nominated by the Board of Direction. These outside members might be in considerable number, perhaps one or more from each state or group of states so that the committee could keep in touch with public affairs affecting the profession in all parts of the Union.

Further, our Committee on Engineering Education should, in my opinion, be enlarged, supplied with funds, and encouraged to active and exhaustive work. If we could lay down the principles which we believe should govern in engineering education, the general curriculum which should be adopted, the proportion of the humanities which should be included, and similar matters, we might, I believe, do much good and, while still leaving ample room for individual initiative and divergencies in practice in different institutions, render effective aid to those teachers who are striving to resist some prevailing tendencies.

In the next place, I believe it will be wise to have more committees of the Society, dealing with specific problems, than we have had in the past. You have before you at this meeting, I am glad to state, a report from the Board of Di-

rection stating that, as provided in the Constitution, it has voted to appoint two special committees to deal respectively with the regulation of streams and with uniform water legislation. I believe that still other committees could be appointed to advantage. We have no reason to be afraid of having too many committees. We should, rather, be sure that we lose no opportunity to exercise legitimate influence on public opinion or to aid in the solution of large problems. We might well, I believe, have a standing committee on conservation, another perhaps on corporation legislation, another on the history of American engineering. Let us give our earnest attention to this matter and let us not hesitate to suggest any and every means that may occur to us to promote the welfare of the Society, of the profession, and of the public. The Board of Direction will be always ready, I am sure, to act promptly with such members of the Society who can show a proper field for all legitimate action.

Reviewing, then, the points which I have brought to your attention, I have endeavored to show that the problem of the times is preëminently a social problem. I have outlined some of the tendencies of the day, as they appear to me, I have given the reasons for my belief that it is the duty of engineers to aid in the solution of these problems and that by training and experience they are well qualified to do so. If my tone has appeared to indicate a pessimistic attitude toward the tendencies of the day, I fear I must plead guilty in some degree to the imputation; whether wisely or not, as the years have gone by, I have grown more conservative and I find myself having little sympathy with many of the tendencies which I seem to see about me. I believe that this age will be looked upon by future generations, not as an age of progress, but more distinctly as an age of deterioration, an age of fads, frivolities, fancies and follies; of much reading and little thought; an age of impulse rather than an age of reason. But after all, it is only an epoch in the history of man. It will pass away, and others will solve the problems that we leave to them. May we do our part, as members of one of the greatest professions, to help direct the tendencies of the day in such manner that our successors may look back upon us with approval and not with blame, and that we may aid in forwarding the true progress of mankind.

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A Four-Story Concrete Building Collapsed, on June 13, while under construction at Vancouver, B. C.

A Northbound Lake Shore Passenger Train Struck a work train head-on, a mile north of Kalamazoo, on June 18. Twelve persons were injured. The cause of the accident is laid to a misunderstanding of orders.

Two Surface Cars Collided on June 22, in Brooklyn, N. Y. A Fifth Ave. car, going east on Court St., was struck by a Crosstown car. It is claimed that the accident was caused by the nonperformance of the brakes on the latter car. Seven persons are known to have been injured.

A Man Was Boiled to Death while cleaning one of the boilers of the cruiser "Birmingham," lying in the Philadelphia Navy Yard, June 14. The man was about to leave the boiler when the steam was suddenly turned on with such force that he was unable to escape. Commandant Grant has ordered an inquiry into the matter.

A Rear-End Crash on the Creve Cœur Lake line of the United Railways, in St. Louis County, Mo., on June 15, resulted in the injury of 22 persons. The accident is claimed to have been caused by a defective air brake on the colliding car. The motor reversed alright, but the momentum of the car was too great to prevent the collision.

A Defective Derailing Switch, installed near the Harlem River drawbridge, at 133d St., New York City, derailed the rear car of the southbound Croton local, on the New York Central R.R., on June 20. The switch was placed at this point to save any train from plunging into the river should the drawbridge be open. In this case the bridge was closed and the signals indicated this condition. The fact that the local was proceeding at only about six miles per hour, prevented a more serious accident.

A New Mississippi River Bridge, at Memphis, Tenn., is to be begun soon according to reports. It is stated that the bridge, which is to be built and used jointly by the Chicago, Rock Island & Pacific, Missouri Pacific and St. Louis Southwestern railways, is to be named the "J. T. Harahan Bridge," after the late president of the Illinois Central R.R., who before his death has projected a bridge at this place to supplement the famous Memphis Bridge built about 20 years ago by the late George S. Morison.

The South Guard Pier of the Congress St. Bridge across the Hudson River, at Troy, N. Y., slid into the river without warning at 3 a.m., June 7, 1913. This pier, with its companion pier on the north side of the bridge, was located just beyond the center pier of the swing span of the bridge and was used only to guard that pier and not as a rest for the opened swing span. It was of masonry construction resting on a wooden crib, with no pile footing. No particular attention had been paid to these guard piers as they carried none of the load of the bridge. It is supposed that the Spring flood this year undermined the wooden crib and wrecked the foundation. The pier was built in 1872 and 1873.

The sinking masonry did some damage to cross-river cables at this point and caused some trouble with the local trolley system.

Faulty Design of the Timbering Caused the Tunnnel Accident which took place in the subway excavation at Fifty-Sixth St. and Lexington Ave., New York City, on June 14, according to the verdict of the coroner's jury (rendered on June 20).

The jury said:

> We find that the said accident was due to the faulty design of the timbering. We further find that in view of the extraordinary width of the said tunnel in proportion to the rise of the arch an error in judgment was made by the engineers of both the Public Service Commission and the Bradley Contracting Co. in using the form of centering adopted, which form of centering has shown itself to be unsafe for tunnels of this nature and width.
>
> We recommend the use in future of some other system.

The experts on the jury were Frank E. Conover, a builder, of 34 West 33d St.; Reginald Pelham Bolton, engineer, of 55 Liberty St.; Ernest Flagg, architect, of 109 Broad St.; Charles Sooysmith, consulting engineer, of 71 Broadway; E. Marshall, consulting engineer, of 115 Broadway, and Charles H. Gillespie, architect, of 1123 Broadway.

In this accident (described in our issue of June 19) a cave-in of three to four hundred tons of rock, crushed to death ten workmen and injured three.

Four Bridges Burned In One Week—On June 9, the wooden truss bridge, resting on cast-iron columns, over the tracks of the New York & Long Branch R.R., at Middletown, N. J., was burned, apparently the result of a spark from a locomotive. Traffic on the railroad was tied up for three hours, and the highway was closed for repairs.

On the same date the floor of the $2,000,000 North Kansas City steel bridge caught fire from some unknown cause. The structure carried the tracks of the Kansas City, Clay Co. & Excelsior Springs trolley line and a highway; and travel was stalled. The wooden flooring and ties were creosoted, and burned so fiercely that the rails were bent and many of the steel beams buckled.

The floor of the two-track deck-girder bridge of the Delaware, Lackawanna & Western R.R., which spans the Passaic River at Little Falls, N. J., was burned on June 15. The ties were impregnated with creosote and 600 of them were destroyed and the rails distorted.

The old, four-track, wooden trestle over Newark Bay, between Bayonne and Waverly, N. J., used jointly by the Pennsylvania and the Lehigh Valley railroads, was destroyed for a distance of about 3500 ft. out from the Bayonne shore, on June 15. Thirty-two cars, loaded with farm produce, were lost. The ties of the two Lehigh Valley R.R. tracks only were creosoted.

The Richmond, Va., Bridge Competition, which was referred to in an editorial in "Engineering News," May 29, 1913, p. 1134, has been turned over to a commission of engineers for final decision. As was noted in the editorial referred to, this competition was advertised in February to be opened Apr. 15. The competition, in our opinion, was subject to many criticisms, not the least of which was the long delay in the examination of the plans and the award of the prize. It now appears that the Administrative Board defends their delay by claiming that a number of the competing engineers asked for a hearing and requested that the time appointed for such hearing be from 30 to 60 days from the date of opening of plans. At any rate, on June 18, the Board passed the following motion:

> WHEREAS no other engineers offering designs for the bridge have expressed a desire to appear before the Board to explain their plans and the Board having given all full opportunity having delayed the award as long as can reasonably be expected, all plans having been opened in the presence of the Board and viewed with the explanation and aid of two engineers.
>
> THEREFORE, be it resolved that all plans and designs for the bridge, specifications and letter filed therewith are hereby referred to the City Engineer, J. A. Johnson, H. P. Beck and Carlton McCarthy with authority to associate such others as they may desire to report to the Board the names of the successful competitors in their judgment for the prizes offered by the Board in accord with the City Engineer's advertisement.

The Hamburg-American Steamship "Imperator," the largest vessel afloat, arrived in New York on Wednesday, June 18,

at the end of her maiden voyage across the Atlantic. The "Imperator" has a length of 919 ft. overall, with 98-ft. beam and is a vessel of 50,000 tons register. She is propelled by four screw propellers of about 16 ft. diameted, driven at 185 r.p.m. by compound steam turbines with a capacity of 62,000 hp. She is intended to make the trip from Hamburg to New York in six days at an average speed of 22½ knots. Her three huge funnels are each 32 ft. in length by 18 ft. in width and their tops are about 150 ft. above the water level. In the hull construction of the "Imperator," there is an entire inner hull extending above the water line. Her athwartship bulkheads divide the hull into 17 watertight compartments and have been carried up to the level of the second deck, high above the water line.

PERSONALS

Mr. George T. Bacon has been appointed General Manager of the Owego Bridge Co., Owego, N. Y.

Mr. D. McD. Campbell, Assoc. M. Can. Soc. C. E., has resigned as City Engineer of Sydney, N. S., to engage in private practice.

Mr. Jesse Taylor, of Jamestown, Ohio, has been appointed General Secretary of the National Highways Association, Washington, D. C.

Mr. D. T. Easby, formerly Supervisor of the Pennsylvania R.R., at Newport, Penn., has been promoted to be Division Engineer at Oil City, Penn.

Mr. C. E. Zortman, formerly Supervisor of the Pennsylvania R.R., at Pittsburgh, Penn., has been promoted to be Division Engineer at Pittsburgh.

Mr. T. H. Booz, Jr., until recently County Engineer of Floyd County, Ga., is now City Engineer and Superintendent of Public Works of Rome, Ga.

Mr. Andrew Rinker, for many years City Engineer of Minneapolis, Minn., has opened an office in the Plymouth Bldg., Minneapolis, for private practice as a consulting municipal engineer.

Mr. Frank W. McKinney, Assoc. M. Am. Soc. C. E., Assistant Engineer of the Baltimore Sewerage Commission, has been appointed Chief Engineer of the Commission for Opening Streets, Baltimore.

Mr. C. E. Brinser, recently Division Engineer of the New York, Philadelphia & Norfolk R.R., Cape Charles, Va., has been appointed Division Engineer of the West Jersey & Sea Shore R.R., at Camden, N. J.

Mr. Maurice H. Thatcher has resigned as a member of the Isthmian Canal Commission and head of the Department of Civil Administration, Canal Zone, Panama. He was appointed in 1910 by President Taft.

Mr. C. A. Coffin, Assoc. Am. Inst. E. E., has resigned as President of the General Electric Co., Schenectady, N. Y., and has been elected Chairman of the Board of Directors, with office at 30 Church St., New York City.

Mr. Wm. Alexander Duff, Assoc. M. Can. Soc. C. E., has resigned his position with the Commissioners of the Transcontinental Ry. of Canada, to become Engineer of Bridges of the Intercolonial Ry, at Moncton, N. B.

Mr. Thomas B. Kennedy, recently Assistant to the Chief Engineer, has been appointed Chief Engineer of the Cumberland Valley R.R., succeeding Mr. George C. Koons, transferred as noted in our issue of last week.

Mr. F. H. Morris, for the past 10 years Assistant Engineer with the Massachusetts State Highway Commission, has been appointed Senior Highway Engineer of the United States Office of Public Roads, Washington, D. C.

Mr. T. J. Skillman, recently Supervisor of the Pennsylvania R.R., at New York City, has been promoted to be Division Engineer of the New York, Philadelphia & Norfolk R.R., at Cape Charles, Va., succeeding Mr. C. E. Brinser, transferred, as noted elsewhere.

Mr. Francis K. Newcomer, son of Lieut.-Col. Henry C. Newcomer, Corps of Engineers, U. S. A., has just graduated from the United States Military Academy at West Point, at the head of his class. Lieut.-Col. Newcomer graduated at the head of his class in 1886.

Mr. Robert T. Frazier, a patent lawyer and for several years employed in the United States Patent Office, Washington, D. C., has been appointed Assistant Commissioner of Patents. He is a native of Tennessee and a graduate of the United States Naval Academy at Annapolis.

Mr. J. G. Seyfried, formerly Structural Engineer of the Grand Trunk Ry., at Montreal, Que., has been appointed Engineer of the bridge department of the Canada Foundry Co., Ltd. Mr. Seyfried will make his headquarters at the Toronto plant, where he will also serve as Assistant to the Manager, Mr. J. L. Brower, M. Can. Soc. C. E.

Col. George Washington Goethals, M. Am. Soc. C. E., Chairman of the Isthmian Canal Commission, and Chief Engineer of the Panama Canal, was awarded the honorary degree of LL. D. by the University of Pennsylvania on June 18. Col. Goethals has previously received honorary degrees from Columbia University, Yale University and Harvard University.

Mr. Thomas Ewing, Jr., a patent lawyer and member of the firm of Ewing & Ewing, New York City, has been appointed Commissioner of Patents, Washington, D. C. Mr. Ewing is a native of Kansas and has received degrees from the University of Wooster, Ohio, Columbia University and Georgetown University. For two years, 1888-1890, he was an Assistant Examiner in the United States Patent Office.

Mr. Samuel R. Lewis, Past-President of the American Society of Heating and Ventilating Engineers, of the firm of Lewis & Kitchen, Chicago, Ill., and Kansas City, Mo., has been appointed Consulting Engineer of the National Incinerator Co., New York City, which company has taken over the incinerator business of Lewis & Kitchen. The heating and ventilating business of the firm of Lewis & Kitchen will continue without change.

Mr. H. M. Waite, City Engineer of Cincinnati, Ohio, is reported to be in search of an engineer to take charge of surveys and plans for converting the old Miami & Erie Canal into a subway and boulevard. According to the Cincinnati "Times-Star," of June 13, Mr. Waite has recently been in New York City for the purpose of interviewing engineers who have had experience on the New York subways.

Mr. F. N. Huddleson, of the city engineering department of Salt Lake City, Utah, has been promoted to be Principal Assistant Engineer, succeeding Mr. John Duder, Assoc. M. Am. Soc. C. E., resigned, as noted in our columns of last week. Mr. Huddleson graduated in mechanical engineering from Ohio State University in 1902, and for some years previous to his employment with the city engineering department of Salt Lake City, he was with the engineering staff of the San Pedro, Los Angeles & Salt Lake R.R.

Mr. F. I. Cabell, Chief Engineer of the Chesapeake & Ohio Ry., has been appointed Chairman of the Valuation Committee of the railway, consisting of Messrs. J. P. Nelson, Real Estate Agent, and E. M. Thomas, Accountant. This committee will be relieved of all other duties and will devote its whole time to valuation work. The duties of Chief Engineer will be temporarily performed by Mr. W. F. Steffens, Assoc. M. Am. Soc. C. E., Assistant Chief Engineer, and formerly Engineer of Structures of the Boston & Albany R.R., at Boston, Mass.

Mr. George P. Johnson, recently Receiver for the Detroit, Toledo & Ironton Ry., Detroit, Mich., and former General Superintendent of the Western division of the Norfolk & Western Ry., has been appointed General Manager of the Chesapeake & Ohio Ry., with office at Richmond, Va. Mr. Johnson began railway work in 1890 as a clerk with the Chicago, Burlington & Quincy R.R. He first entered the service of the Norfolk & Western Ry. in 1898 as General Yardmaster at Kenova, W. Va., having come from a similar position with the Lake Shore & Michigan Southern Ry. at Toledo, Ohio.

Mr. Delos F. Wilcox will sever his connection with the Public Service Commission for the First District, New York State, on July 1, to engage in private practice as a consulting franchise and public utility expert, with offices at 93 Nassau St., New York City. Mr. Wilcox is a graduate of the University of Michigan and of Columbia University. He has been Chief of the Bureau of Franchises of the Public Service Commission since 1907. He will specialize in making franchise surveys, formulation of franchise policies, drafting or criticism of public utility legislation and franchise sections of city charters, the negotiation of franchise settlements, etc., for cities or other public bodies and for civic and business organizations devoted to the public welfare.

Mr. Henry R. Towne, Past-President, Am. Soc. M. E., President of the Yale & Towne Manufacturing Co., of Stamford, Conn., has resigned as President of the Merchants Association of New York City, after more than five years' service. Mr. Towne began his work for the Association, which was "created to foster the trade and welfare of New York," in 1900, as a member of the Engineering Sub-Committee of the Ramapo Committee, through whose work the Association defeated the Ramapo water-supply project. One result of this work was the establishment of the present Board of Water Supply under whose management the new Catskill water-supply has been developed. Mr. Towne was elected President

of the Association in 1908, and has been reëlected successively every year since.

Mr. E. Wilbur Rice, Jr., M. Am. Inst. E. E., formerly Vice-President, has been elected President of the General Electric Co., Schenectady, N. Y., succeeding Mr. C. A. Coffin, resigned as noted elsewhere. Mr. Rice was born at La Crosse, Wis., May 6, 1862; his father is Mr. Edwin Wilbur Rice, famous editor and writer on religious subjects, of Philadelphia, Penn. Mr. E. W. Rice, Jr., was educated in the public schools of Philadelphia, and the Central High School, where he graduated in 1880. He was Superintendent of the Thomson-Houston Electric Co., now the Lynn, Mass., plant of the General Electric Co., from 1883 to 1888, and Technical Director from 1888 to 1894. Upon the formation of the General Electric Co., he was elected Vice-President, which office he has held ever since. Mr. Rice is a Chevalier of the Légion d'Honneur, of France, and a member of the Institution of Civil Engineers and of the Institution of Electrical Engineers of Great Britain.

OBITUARY

Frederic Danforth, M. Am. Soc. C. E., Consulting Engineer, and Chief Engineer of the Eastern Maine R.R., of Gardiner, Maine, died at his summer home at Squirrel Island, June 6. He was born in 1848 and graduated from the Thayer School of Civil Engineering, Dartmouth College, in 1870.

C. S. Williamson, of Mason, Ohio, a civil engineer in charge of a survey party under the Mississippi River Commission, was drowned on June 22, together with eight of his party, when the launch in which they were at work was struck by a squall and capsized. Among those drowned was J. W. McConnell, who graduated in civil engineering at Cornell University in this year's class. Five of the party were saved.

Edwin S. Cramp, M. Am. Soc. M. E., grandson of William Cramp, who founded the firm of Wm. Cramp & Sons, Shipbuilders, of Philadelphia, Penn., died at his home in New York City, June 20. He was connected with the shipbuilding works for many years, and at the time the Cramp interests were sold, in 1907, he was Vice-President of the William Cramp & Sons Shipbuilding Co. It is said to have been due to his ability as a marine engineer that his company was able to obtain $500,000 in bonuses in 1894, for exceeding the speed requirements in contracts for United States war vessels. He was a son of Charles H. Cramp, who died on May 9, last, at the age of 85 years. Edwin S. Cramp was a member of the Society of Naval Architects and Marine Engineers, and was a Vice-President of the American Society of Mechanical Engineers, in 1896-'98.

ENGINEERING SOCIETIES

COMING MEETINGS

AMERICAN SOCIETY OF CIVIL ENGINEERS.
June 17-20. Annual convention at Ottawa, Ont. Secy., Charles Warren Hunt, 220 W. 57th St., New York City.

PACIFIC NORTHWEST SOCIETY OF ENGINEERS.
June 20-21. Annual convention at Seattle, Wash. Secy., Jesse A. Jackson, City Hall, Seattle, Wash.

AMERICAN INSTITUTE OF ELECTRICAL ENGINERS.
June 23-26. Annual convention at Cooperstown, N. Y. Secy., F. L. Hutchinson, 33 W. 39th St., New York City.

AMERICAN WATER-WORKS ASSOCIATION.
June 23-28. Annual meeting at Minneapolis, Minn. Secy., J. M. Diven, Troy, N. Y.

PERMANENT INTERNATIONAL ASSOCIATION OF ROAD CONGRESSES.
June 23-28. Congress at London, England. Secy., W. Rees Jeffreys, Queen Anne's Chambers, Broadway, Westminister, London, S. W.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.
June 24-26. Annual meeting at Minneapolis, Minn. Secy., H. H. Norris, Cornell University, Ithaca, N. Y.

AMERICAN SOCIETY FOR TESTING MATERIALS.
June 24-28. Annual convention at Atlantic City, N. J. Secy., Edgar Marburg, University of Pennsylvania, Philadelphia, Penn.

CANADIAN ELECTRICAL ASSOCIATION.
June 25-27. Annual convention at Toronto, Ont. Secy., T. S. Young 220 King St. West, Toronto, Ont.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS.
June 25-28. Semi-annual meeting at Boston, Mass. Secy., J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

OHIO ELECTRIC LIGHT ASSOCIATION.
July 15-18. Annual convention at Cedar Point, Ohio. Secy., D. L. Gaskill, Greenville, Ohio.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.
July 17-19. Annual summer meeting at Buffalo, N. Y. Secy., E. A. Scott, 29 W. 39th St., New York City.

INTERNATIONAL GEOLOGICAL CONGRESS.
Aug. 7-14. Twelfth annual session at Toronto, Ont. General Secy., R. W. Brock, Director of Geological Survey of Canada, Ottawa, Ont.

THE TRAVELING ENGINEERS' ASSOCIATION.
Aug. 12-16. Annual convention at Chicago, Ill. Secy., W. O. Thompson, New York Central Car Shops, East Buffalo, N. Y.

INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS.
Sept. 1-6. Annual convention at New York City. Secy., Jas. McFall, Roanoke, Va.

NEW ENGLAND WATER-WORKS ASSOCIATION.
Sept. 10-12. Annual convention at Philadelphia, Penn. Secy., Willard Kent, Narragansett Pier, R. I.

AMERICAN PUBLIC HEALTH ASSOCIATION.
Sept. 9-13. Annual meeting at Colorado Springs, Colo. Secy., S. M. Gunn, 755 Boyleston St., Boston.

Colorado Association of Members of the American Society of Civil Engineers—At the annual meeting, on June 14, the following officers were elected for the ensuing year: President, G. N. Houston; Secretary-Treasurer, R. W. Toll, 709 Tramway Building, Denver, Colo.

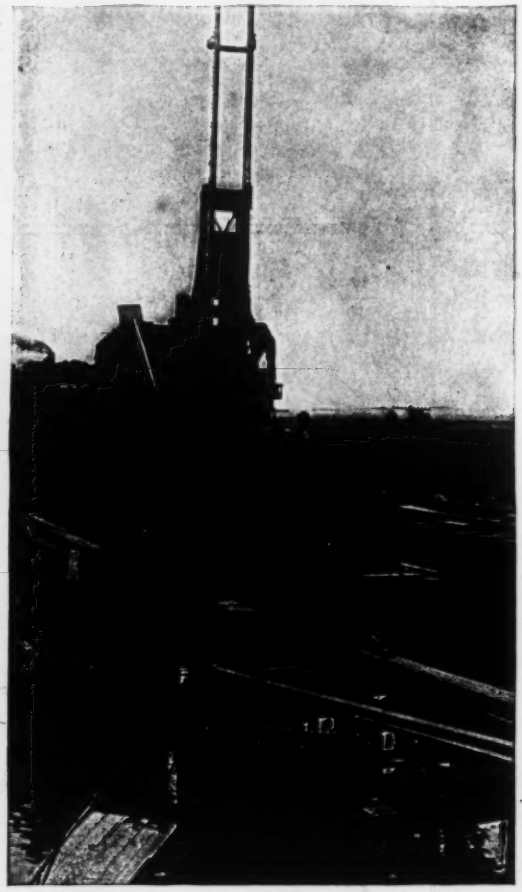
American Society of Mechanical Engineers—What is doubtless the largest and most notable delegation of American engineers that has ever visited Europe in a body, sailed from New York on June 10, on the steamship "Victoria Luise," of the Hamburg-American Line, to attend the international meeting of the American Society of Mechanical Engineers with the Verein Deutscher Ingenieure (the German Society of Engineers), which is without exception the largest by far of any engineering society in the world. The plans and preparations for this notable international meeting have been reported from time to time in the columns of "Engineering News." For nearly a year past a special committee of the American Society has been making the detailed arrangements for the trip, and on the other hand the officers and committees of the German Society of Engineers has been making most elaborate preparations for the entertainment of the visitors. The party sailing on the "Victoria Luise" numbered nearly 250. Additional members who are now abroad joining the party at Hamburg or Leipsic will bring up the number to practically the limit of 300 set by the terms of the invitation, that being as large a party as could be comfortably accommodated in the tour through Germany in the hotels of the various cities to be visited.

The "Victoria Luise" arrived at Hamburg, on June 19. A cable dispatch from Secretary Rice reports that the party was favored with exceptionally fine weather all the way across the Atlantic and that a varied program of entertainment during the voyage was carried through successfully. After two days' sight seeing in Hamburg, the party traveled by special train to Leipsic where the international meeting with the Verein Deutscher Ingenieure was held on Monday and Tuesday. Papers by President W. F. M. Goss, on "Engineering Development and Human Progress," and by James M. Dodge, of Philadelphia, on "Industrial Management" were presented. King Frederick Augustus, of Saxony, was among those present at the international meeting. Announcement was made at the meeting that the German Society had voted to confer the Grashoff Memorial Gold Medal on George Westinghouse, who is a Past-President of the American Society of Mechanical Engineers.

Among the prominent members of the Society who are included in the party which is now in Germany, are Past-Presidents Col. E. D. Meier, John R. Freeman, Worcester R. Warner and Jesse M. Smith; Vice-President James Hartness, Managers Henry Hess and H. M. Leland. From the head office of the Society in New York are Calvin W. Rice, Secretary, and Lester G. French, editor. The technical press is represented by F. E. Schmitt, of "Engineering News," Fred R. Low, of "Power," L. C. Alford, of the "American Machinist," William Kent and Robert Thurston Kent, of "Industrial Engineering." Among the prominent engineering educators are L. P. Breckenridge, of Yale, Arthur M. Greene, Jr., of Renssalaer, Chas. R. Richards, of Cooper Union, and L. S. Marks, of Harvard. The list of other well known men in the party includes Geo. M. Bond, of Hartford, Geo. M. Brill, of Chicago, S. H. Bunnell, of New York, J. S. Detrick, of Baltimore, Wm. A. Doble, of San Francisco, E. R. Fellows, of Springfield, Vt., Geo. H. Frost, of Plainfield, N. J., H. L. Gantt, of New York, Philetus W. Gates, of Chicago, Frank B. Gilbreth, of Providence, R. I., Morris Knowles, of Pittsburgh, Alfred E. Kornfeld, of New York, Wm. Lodge, of Cincinnati, Chas. A. Mead, of Upper Montclair, N. J., Mansfield Merriman, of New York, Samuel L. Moore, of Elizabeth, N. J., H. G. Reist, of Schenectady, Newell Sanders, of Chattanooga, and Walter Wood, of Philadelphia.

The Lake Shore R. R. Bridge over Buffalo River

II. Driving the Lackawanna Steel Sheet Piling Caissons in which Pier Foundations were Built.



The eight caissons for the cylindrical piers of this bridge had to extend down to bed rock, about 36 feet below mean water level. Lackawanna Arched-Web Steel Sheet Piling was chosen for these caissons because of its extreme rigidity and easy driving and pulling qualities. 50 piling sections in 45-foot lengths were driven for each caisson to form a cylinder 18 feet in diameter. The driving was accomplished as shown in the first picture with a revolving pile driver mounted upon a car frame which ran upon temporary tracks.

To furnish a template or guide for driving the cylinders, five wooden piles were first driven, one in the center, and four at the corners of an inscribed square. Diagonal braces connected the circumferential piles, crossing at the center pile. A circular wooden frame or ring, 6-in. deep, and made up of three layers of 2-in. lumber was then attached to the top of the piles as shown in the second picture. Driving of the piling involved no difficulty as the closures of every cylinder came together perfectly. After driving the steel piling, the two crossed timbers in each caisson were sawed off close to the driving form (as shown in the second picture) to facilitate excavation. Further construction features will be shown next week.

There are many other economical ways of driving Lackawanna Steel Sheet Piling and as our engineers keep close tab on hundreds of our installations, they are ready to advise you as to the advisability of using Steel Sheet Piling and how it can best be handled on any work.

Let us solve your piling problems or at least ask us for our literature.

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CHARLES WHITING BAKER, *Editor*

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Report of convention held at Atlantic City, N. J., June 16-18. 3000 w. ENGINEERING NEWS, June 26, 1913.

ANNUAL CONVENTION OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS: *Page* 1344

Report of convention held at Ottawa, Ont., June 17-20. 3000 w. ENGINEERING NEWS, June 26, 1913.

SOME TENDENCIES AND PROBLEMS OF THE PRESENT DAY AND THE RELATION OF THE ENGINEER THERETO: *Page* 1346

Presidential address to the annual convention of the American Society of Civil Engineers at Ottawa, Ont. 5000 w. George Fillmore Swain. ENGINEERING NEWS, June 26, 1913.

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CIRCULATION OF THIS NUMBER OF ENGINEERING NEWS 20,000

None sent free regularly, no returns from news companies, no back numbers

What The Buyer Needs To Know

Number Twenty-Six

At this writing the great Ninth Annual Convention of the Associated Advertising Clubs of America has been brought to a close at Baltimore. The work of the convention is summed up in the following declaration of principles:

We believe in truth, the cornerstone of all honorable and successful business, and we pledge ourselves each to one and one to all to make this the foundation of our dealings to the end that our mutual relations may become still more harmonious and efficient. We believe in truth not only in the printed word, but in every phase of business connected with the creation, publication, and dissemination of advertising.

We believe there should be no double standard of morality involving buyer and seller of advertising or advertising material. Governmental agencies insist on "full weight" packages and "full weight" circulation figures. They also should insist on "full weight" delivery in every commercial transaction involved in advertising. We believe that agents and advertisers should not issue copy containing manifestly exaggerated statements, slurs, or offensive matter of any kind, and that no such statements should be given publicity.

We believe that the present chaotic multiplicity of methods of arriving at verification of circulation statements are not only confusing but inadequate, and that the time for radical revision of these methods and for standardization of statements is the present, and the opportunity for constructive work along these lines is given by the assemblage at this convention for the first time of representatives of all the different interests concerned in this vital matter.

We believe in co-operation with other agencies now at work on this problem, especially in the plan of the Central Bureau of verification, which has already been initiated by some of the organizations represented in the convention, and request the Executive Committee to proceed therewith.

We indorse the work of the National Vigilance Committee, and believe in the continued and persistent education of the press and public regarding fraudulent advertising, and recommend that the commission, with the co-operation of the National Vigilance Committee, should pass upon problems raised and conduct campaigns of education on these lines. We believe it to be the duty of every advertising interest to submit problems regarding questionable advertising to this commission and to the National Vigilance Committee.

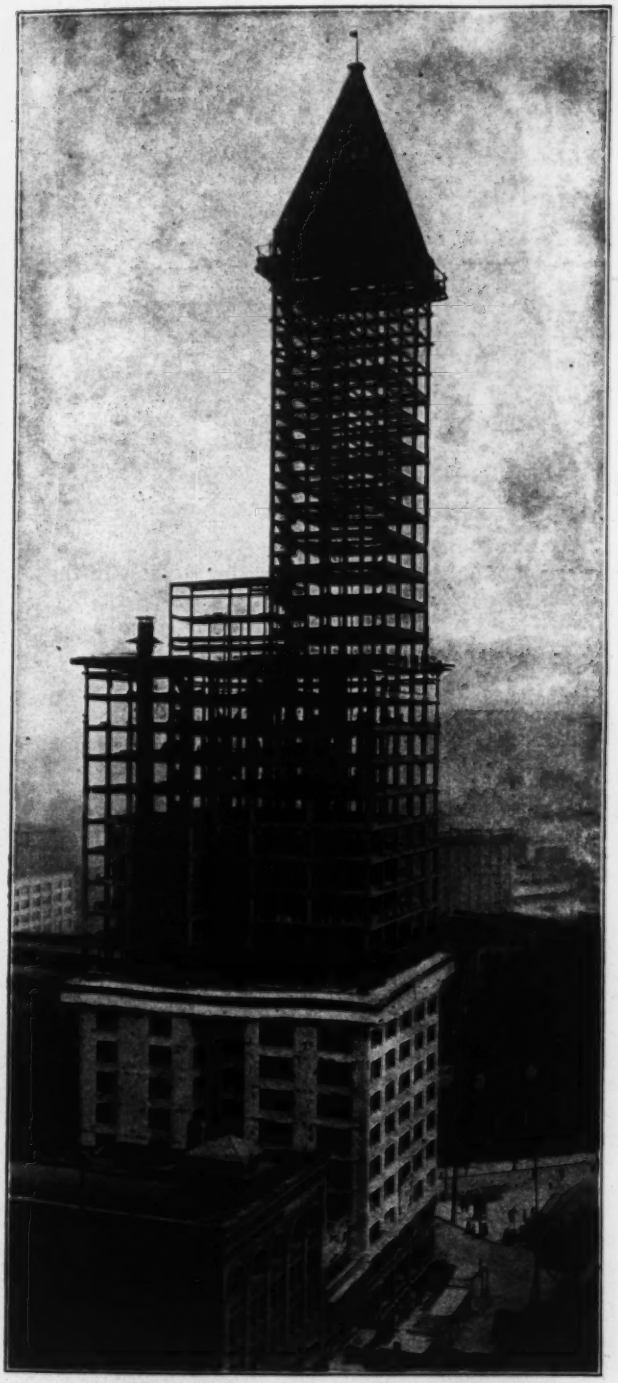
We believe that the elimination of sharp practice on the part of both buyer and seller of advertising and advertising material will result from the closer relationship that is being established, and that in place of minor antagonisms will come personal co-operation to the increased benefit of all concerned and the uplifting of the great and growing business of advertising.

We believe in upholding the hands worthy to be upheld, and we believe that each and every member owes a duty to this association of enforcing the code of morals based on truth in advertising and truth and integrity in all the functions pertaining thereto.

* * *

It must be evident to every buyer of advertised goods that advertising men are determined to keep their house clean.

This association is representative of the reliable advertisers, writers and publishers of the country. They will live up to their creed.



Gaggin & Gaggin, Archs. C. J. Jeppesen, Engr.
Whitney Co., Gen. Contractors.

It Stands On Raymond Concrete Piles

Quite naturally.

It's the nearly completed 42-story L. C. Smith Building in Seattle—the tallest building outside of New York City. They just **had** to be Raymond Concrete Piles. No one would consider building a 42-story structure on concrete piles that have never been seen—piles made by a process not open to inspection. Neither would they think of using piles that were made by pouring green concrete into an unprotected hole in the ground.

These two all-important considerations have to be settled correctly when putting up 42-story buildings.

You may not be planning a 42-story job, but you must positively insist upon having piles the placing of which is open to inspection and which use a protecting shell or form **that remains permanently in the ground.**

Read Am. Soc. Eng. Con. paper "Concrete Piling" and our 168-page Raymond Book.

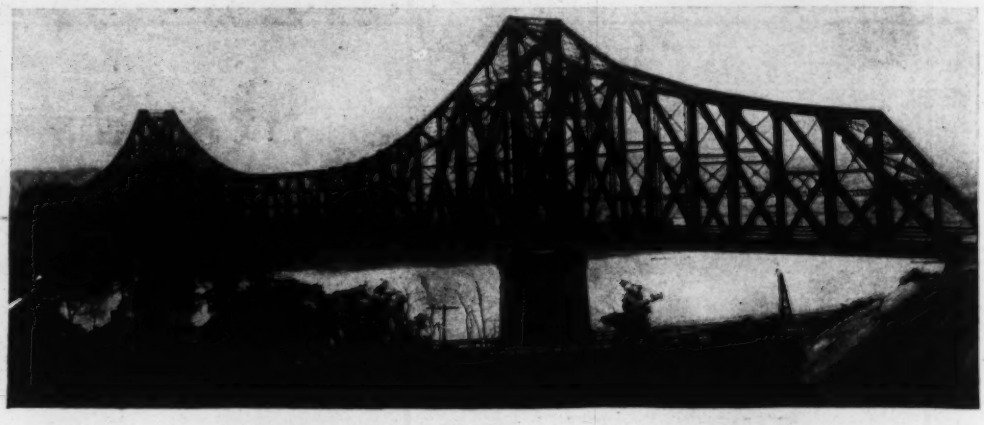
RAYMOND CONCRETE PILE CO.

Engineers and Contractors

NEW YORK AND CHICAGO

Baltimore Pittsburgh St. Louis Detroit Philadelphia
San Francisco Kansas City Portland, Ore. Cleveland
Raymond Concrete Pile Co. Ltd., 822 New Birks Bldg., Montreal, Can.

A form for every pile~ A pile for every purpose



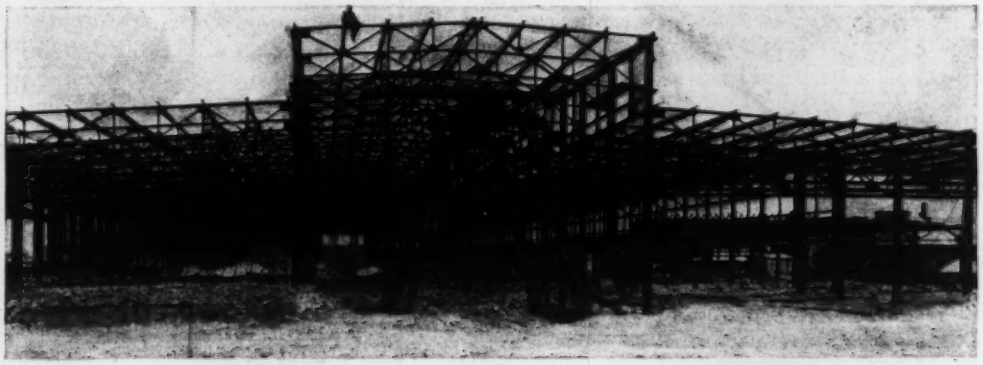
PITTSBURGH & LAKE ERIE RAILROAD BRIDGE of the NEW YORK CENTRAL LINES, over the Ohio River at Beaver, Pa. Weight 16,000 tons.

Cleaned and about 85% of surface first coated with CARBONIZING COATING Paint, all surfaces thereafter receiving two full coats of CARBONIZING COATING Paint, during 1911.

Total amount of CARBONIZING COATING Paint consumed on the three (3) coats, 3638 gallons; total tonnage painted, 44,175 tons.

Average cost per ton, for paint, at $1.50 per gal., 12 1-4c. per ton, per coat.
" " " " " " at $1.25 per gal., 10 3-10c. per ton, per coat.

The lowest cost per ton, per coat, for paint in America, and one of the best painted structures in the world.



EDWARD FORD PLATE GLASS COMPANY'S Plant, Rossford, Ohio. Composed of fourteen (14) buildings; weight about 2,700 tons. Fabricated, erected and painted, 1911.

CARBONIZING COATING Paint used in fabricating, assembling, and one complete shop coat. All defaced portions retouched with CARBONIZING COATING Paint at time of erection, and one complete coat CARBONIZING COATING Paint applied after erection.

The structural steel in these buildings is very light, making an unusually great volume of surface to be painted as compared with the tonnage.

Total amount CARBONIZING COATING Paint consumed in fabricating, assembling, shop coat, retouching, and one complete field coat, 3000 gallons.

Cost of CARBONIZING COATING Paint used in fabricating, assembling, and shop coat, at $1.50 per gallon, $0.99 per ton. Cost of CARBONIZING COATING Paint used in retouching and one complete field coat, at $1.50 per gallon, $.0.67 per ton.

On the basis of price now prevailing, i.e., $1.25 per gallon, the fabricating, asembling and shop coat would cost $0.83 per ton. The retouching and one complete field coat would cost $0.56 per ton, the average in square feet being quite an item over 1000 square feet per gallon, per coat.

Manufactured exclusively by

THE GOHEEN MANUFACTURING COMPANY

London, E. C., England **CANTON, OHIO, U. S. A.**

TRIDENT WATER METERS

1,000,000 *made and sold in less than 21 years—watch it grow to* 2,000,000.

The Required Sturdiness for the Big Flows

Trident Crest Meter

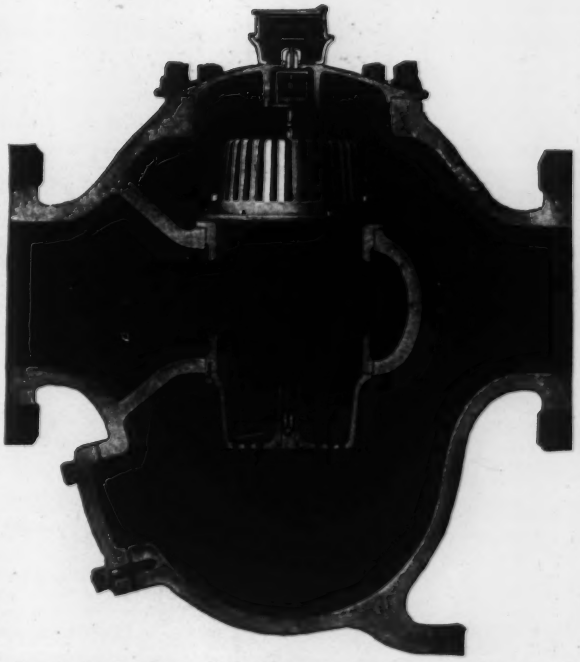
You read the total volume of water passing through the meter directly from the register.

And you read it without any fear that it may be inaccurate. For the Trident Crest Meter gives constant service for years.

The mechanism cannot fail—it is so simple.

You can inspect it easily and quickly without removing the meter from the line.

For heavy service, Trident Crest Meters are the *logical* meters to install.



Write for Catalog

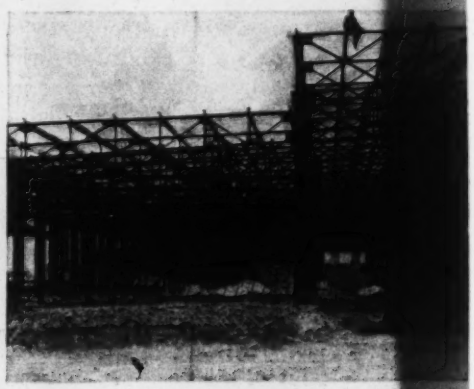
There is "a Trident Meter for every service." All the principal types are described in the Catalog we shall be glad to send you on request.

Neptune Meter Co., 90 West St., New York

Cincinnati Chicago Boston Atlanta Los Angeles San Francisco Portland Seattle

PITTSBURGH & LAKE ERIE R
CENTRAL LINES, over the Ohio

Cleaned and about 85% of surface first coated
thereafter receiving two full coats of CARBONIZ
Total amount of CARBONIZING COATING
total tonnage painted, 44,175 tons.
Average cost per ton, for paint, at $1.50 per gal.,
" " " " " " at $1.25 per gal., 1
The lowest cost per ton, per coat, for paint in A
world.



EDWARD FORD PLATE GLASS CO
fourteen (14) buildings; weight about 2,7

CARBONIZING COATING Paint used in fabri
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Manufactured exclusively by

THE GOHEEN MANUFACTURING COMPANY

London, E. C., England **CANTON, OHIO, U. S. A.**

PAG
MISS

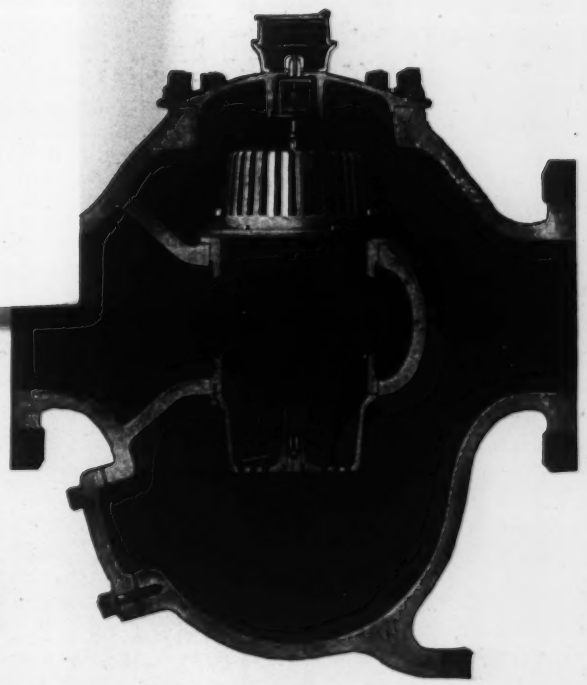
TRIDENT WATER METERS

1,000,000 *made and sold in less than 21 years—watch it grow to* 2,000,000.

GES

SING

The Required turdiness or the ig Flows



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Neptune Meter Co., 90 West St., New York

Cincinnati Chicago Boston Atlanta Los Angeles San Francisco Portland Seattle

Give the Man with the Shovel a Chance

Give him the opportunity to use a shovel that is best for him to use *physically*.

Give him a chance to increase his capacity —to do his most productive work for you.

A shoveler does his best day's work taking an average shovel load of 21 pounds.

And—get this, please!—he does his best day's work because it is the amount of work that is best for him to do.

Take your own case.

You know the feeling of lassitude, of inertia, after you have done too little work in a day. You know it as well as you know the feeling of weariness after you have done too much.

In fact the feeling produced by too little work is not so far different from the feeling produced by too much.

It is only when you have done the right amount of work that the end of the day finds you satisfied—satisfied physically.

This is all there is to the fact that a shoveler does so much more work using the shovel that is best for him.

Wyoming 21-Pound Load Shovels are the efficiency load shovels.

They are made for any given material—dirt, sand, cement, gravel, etc., etc.

When a shoveler uses a Wyoming 21-Pound Load Shovel he handles twice as much dirt, sand or whatever the material may be.

And he does it *naturally* and *unconsciously*.

WYOMING
"21 POUND LOAD"
SHOVELS

Get the Book—Free

For full particulars write for a copy of "Scientific Shoveling"—an excerpt from Frederick W. Taylors "Principles of Scientific Management." It will be sent you for the request.

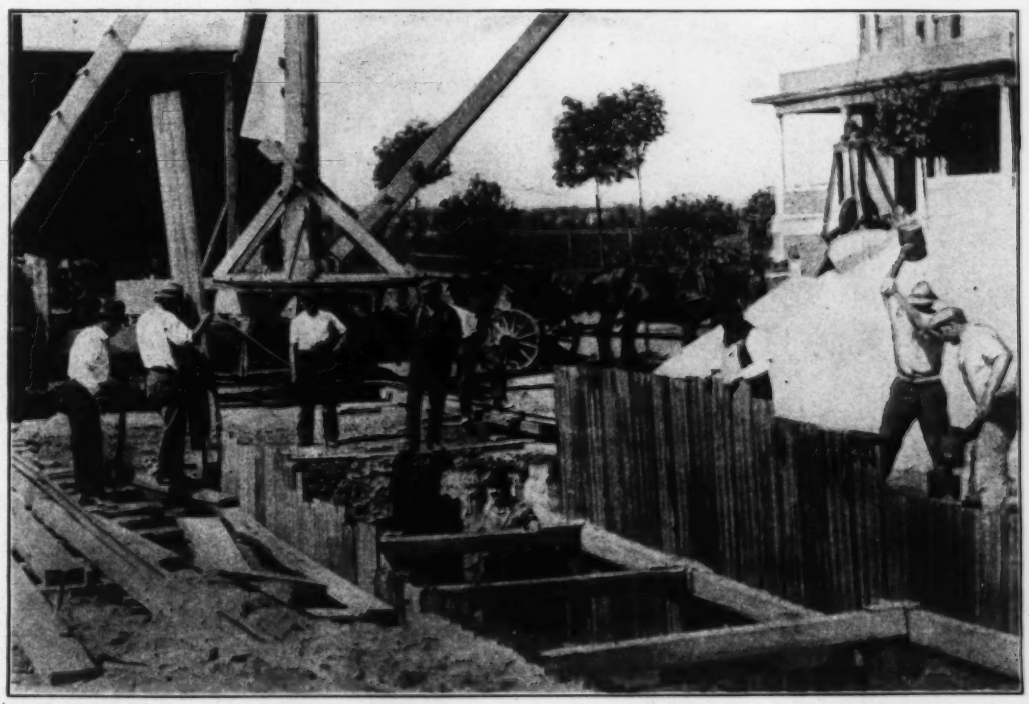
The Wyoming Shovel Works, Wyoming, Pa.

Makers of Good Shovels for Almost 40 Years.

Why Steel Sheet-Piling for Sewer Trenches?

Because It

Drives Quicker
Covers More Area
Lasts Longer in Use
Is Ultimately Cheaper Than Wood Sheeting.



THIS SEWER was constructed in sandy soil which would not stand without sheeting. Corrugated Steel Sheet-Piling was used because it is LIGHT, STRONG and practically INDESTRUCTIBLE. Notice on the left side of the picture one man handling a sheet 12″ wide and 10′ long with the same ease he would handle a 2″x10″ plank, while behind him stands a man ready to drive the sheet into place. On the right side two men are driving a sheet using a special driving cap required when the sheet-piling is driven by hand.

Each sheet of this type corrugated steel sheet-piling covers an area 12″ in width. Owing to the thin section, the sheets can be driven more rapidly than the usual planking. This means a great saving in time alone.

Wemlinger Steel Piling Co., 11 Broadway, New York City

The Wemlinger Company, Inc., 11 Broadway, New York City, associated with the Wemlinger Steel Piling Company, are specialists on approved methods of waterproofing concrete. Specifications and tables for computing quantities and cost of waterproofing will be sent on request.

An Actual Record Of Up-Keep Cost On

"Butterfly" Stope Drills

One of the largest mining companies in the country operated, during 1912, fifty-seven Ingersoll-Rand "BC-21" ("Butterfly") Hammer Drills, of which fourteen were bought in 1910 and fourteen in 1911.

The total bill for repair parts on these drills for 1912 was $920.23 or $16.14 per machine per year. As probably 10 per cent. of the repair parts remained on hand at the end the year, the figures become $14.53 per drill year or $1.21 per drill month.

This is the "BC-21" Butterfly Stoper That Made This Record

NEW YORK **INGERSOLL-RAND CO.** LONDON

Offices the World Over.

Compressors **Rock Drills** **Stopers**

11-HD

Mr. Road Builder—

Are there some places in your roads where a culvert is necessary, and where it is impossible to secure an absolutely solid foundation?

Are there other places to which it is hard to transport sand, gravel and other materials for masonry?

Can you personally superintend the selection of all materials and every phase of construction of your bridges and culverts, or must some details be left to others?

Can you always close a road for two weeks while masonry is "setting," or is it desirable to dig the trench and fill it up on the same day?

American Ingot Iron Corrugated Culverts

will dispose of any or all of these difficulties. They are

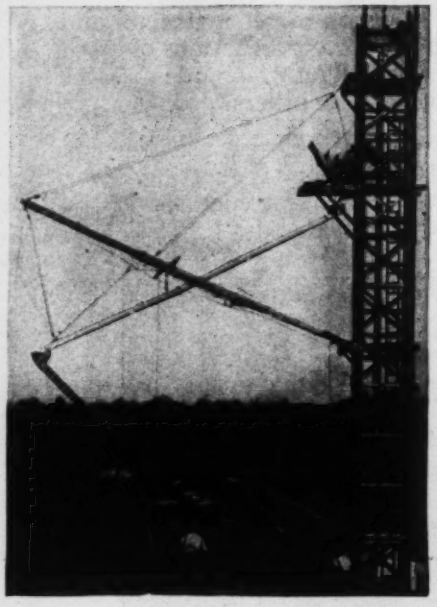
Strong Convenient Lasting

Write to the nearest Manufacturer for particulars and prices on **American Ingot Iron Culverts** (Full Circle or Segmental) Plates, Sheets, Roofing and Formed Products.

ARKANSAS, Little Rock, Dixie Culvert & Metal Co.
CALIFORNIA, Los Angeles, California Corrugated Culvert Co.
CALIFORNIA, West Berkeley, California Corrugated Culvert Co.
COLORADO, Colorado Springs, Colo. Ingot Iron Pipe & Flume Co.
DELAWARE, Clayton, Delaware Metal Culvert Co.
FLORIDA, Jacksonville, Dixie Culvert & Metal Co.
GEORGIA, Atlanta, Dixie Culvert & Metal Co.
ILLINOIS, Bloomington, Illinois Corrugated Metal Co.
INDIANA, Crawfordsville, W. O. O'Neall Co.
INDIANA, Princeton, W. O. O'Neall Co.
IOWA, Des Moines, Iowa Pure Iron Culvert Co.
IOWA, Independence, Independence Corrugated Culvert Co.
KANSAS, Topeka, The Road Supply & Metal Co.
KENTUCKY, Buechel, Kentucky Culvert Co.
LOUISIANA, New Orleans, Dixie Culvert & Metal Co.
MARYLAND, Havre de Grace J. N. Spencer
MASSACHUSETTS, Palmer, New England Metal Culvert Co.
MICHIGAN, Bark River, Bark River Bridge & Culvert Co.
MICHIGAN, Lansing, Michigan Bridge & Pipe Co.
MINNESOTA, Minneapolis, Lyle Corrugated Culvert Co.
MINNESOTA, Lyle, Lyle Corrugated Culvert Co.
MISSOURI, Moberly, Corrugated Culvert Co.
MONTANA, Missoula, Montana Culvert Co.
NEBRASKA, Lincoln, Lee Arnett Co.
NEBRASKA, Wahoo, Nebraska Culvert & Mfg. Co.
NEVADA, Reno Nevada Metal Mfg. Co.
NEW HAMPSHIRE, Nashua, North-East Metal Culvert Co.
NEW JERSEY, Flemington, Pennsylvania Metal Culvert Co.
NEW YORK, Auburn, Pennsylvania Metal Culvert Co.
NORTH CAROLINA, Greensboro, Dixie Culvert & Metal Co.
NORTH DAKOTA, Wahpeton, Northwestern Sheet & Iron Wks.
OHIO, Middletown, American Rolling Mill Co.
OHIO, Middletown, Ohio Corrugated Culvert Co.
OKLAHOMA, Shawnee, Dixie Culvert & Metal Co.
OREGON, Portland, Coast Culvert & Flume Co.
PENNSYLVANIA, Warren, Pennsylvania Metal Culvert Co.
SOUTH DAKOTA, Sioux Falls, Sioux Falls Metal Culvert Co.
TENNESSEE, Nashville, Tennessee Metal Culvert Co.
TEXAS, Dallas, Atlas Metal Works,
TEXAS, El Paso, Western Metal Mfg. Co.
TEXAS, Houston, Lone Star Culvert Co.
UTAH, Woods Cross, Utah Culvert Co.
VIRGINIA, Roanoke, Virginia Metal & Culvert Co.
WASHINGTON, Spokane, Spokane Corr. Culvert & Tank Co.
WISCONSIN, Eau Claire, Bark River Bridge & Culvert Co
WISCONSIN, Madison, Wisconsin Culvert Co.

IN PLACING CONCRETE

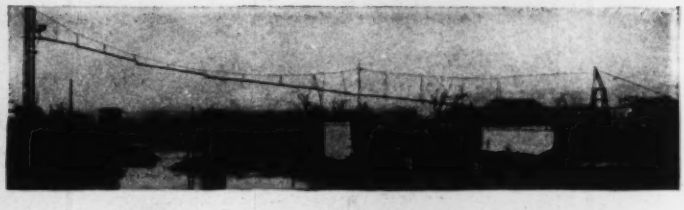
THE SELECTION OF EQUIPMENT IS MOST VITAL



A Mistake Means a Loss

THE INSLEY METHOD

is the Method of Greatest Economy Regardless of the Character of the Work



For a Compact Flexible Plant and a Clear Floor on Buildings **OR** **For Long Distance Spouting on Bridges and Dams**

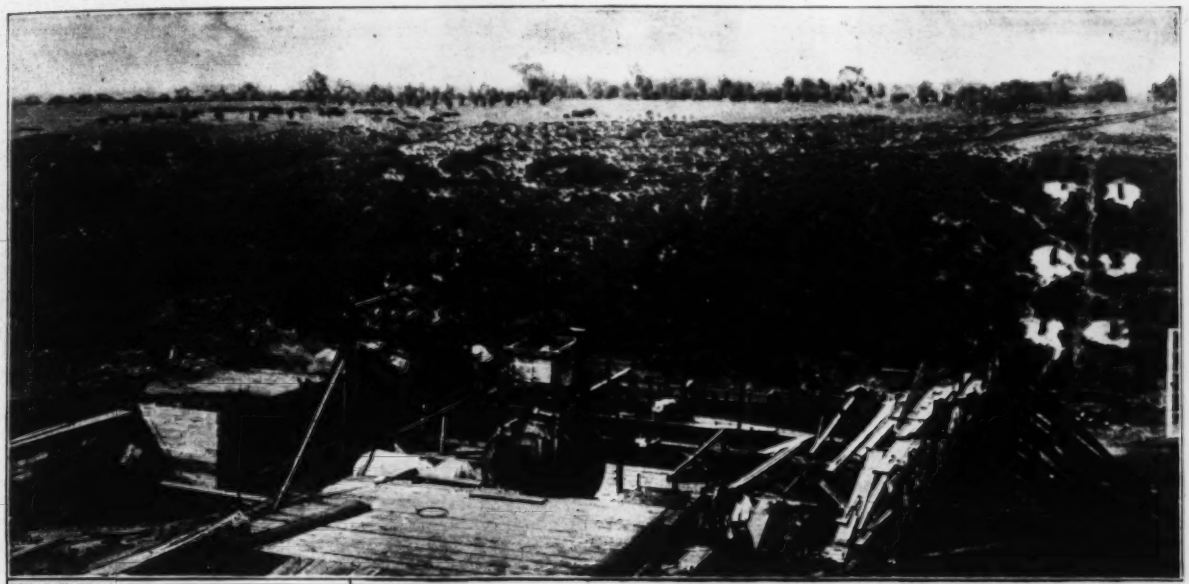
WE MANUFACTURE ALSO A COMPLETE LINE OF BUCKETS, CARS AND SKIPS

W. E. Austin Mach. Co., Atlanta, Ga., Southern Sales Managers.
Mussens Limited, Montreal, Toronto, Quebec, Cobalt, Winnipeg, Calgary, Vancouver, Halifax and St. John.
BOSTON—Dyar Supply Co., 510 Main St., Cambridge, Mass.
NEW YORK—Knapp Machinery Supply Co., 120 Liberty St.
PHILADELPHIA—Henry T. Peirce, 704 Bulletin Bldg.
PITTSBURGH—Zeigler-Whaley Co., Keystone Bldg.
DETROIT—Wm H. Cameron, 39 Buhl Block.
CINCINNATI—C. Taylor Handman, Merchants Bldg.
LOUISVILLE, KY.—W. E. Austin Machinery Co., 306 W. Main St.
ST. LOUIS—R. H. Hyland & Co., 702 New Bank of Commerce Bldg.

SALES OFFICES:

CHICAGO—R. H. Hyland & Co., 725 S. Dearborn St.
DES MOINES—The Contractors Supply Co., 621 Equitable Bldg.
KANSAS CITY—H. C. Darnell & Co., 1925 Grand Ave.
DENVER—Contractors Supply & Equipment Co., 338 First National Bank Bldg.
SALT LAKE CITY—Harris Bros., 310 Atlas Block.
SPOKANE—A. L. Wright, 1119 Old National Bank Bldg.
SEATTLE—F. T. Crowe & Co., 411 Globe Bldg.
PORTLAND—F. T. Crowe & Co., 45 Fourth St.
SAN FRANCISCO—Langford, Felts & Myers, 215 Rialto Bldg.
LOS ANGELES, Langford, Felts & Myers, 413-414 Hibernia Bldg.
RIO DE JANEIRO, Brazil—F. C. Diaz, Agent, American Trading Co., Ruo Do Rasario No. 98.
YOKOHAMA, Japan—American Trading Co., 28 Yokohama.
KOBE, Japan—American Trading Co., 99 Kobe.
SYDNEY, Australia—R. W. Cameron & Co., 16, Spring St.
MELBOURNE, Australia—R. W. Cameron & Co., 34, Queen St.
WELLINGTON, New Zealand—R. W. Cameron & Co., 9-10 Australasia Chambers.
BRISBANE, Australia—R. W. Cameron & Co., 332, Queen St.
FREMANTLE, Australia—R. W. Cameron & Co., 13, Nouatt St.
PERTH, West Australia—R. W. Cameron & Co., Selbourne Chambers, Howard St.

Insley Mfg. Co., Engineers Manufacturers Indianapolis, Ind.



What is it?

IT'S the concrete handling machinery used in building the bridge called Puente Espanol at San Diego for the projected Panama-California Exposition. The mixers used exclusively in construction of the exposition buildings are

Ransome

Notice the extreme length of the conducting chute in the lower picture. From the sage and chaparral of the Southwest to the frozen pines of the North you'll find engineers and contractors saving money and doing better work with Ransome appliances. The RANSOME RED BOOK explains why.

Write for YOUR free copy TODAY.

Ransome Concrete Machinery Co.

Dunellen, N. J.

W. E. AUSTIN MACH'Y CO., Southern Sales Mgrs., Atlanta, Ga.
New Orleans, Houston, Dallas, Memphis, Richmond.
W. B. HOUGH CO., Monadnock Block, Chicago, Ill.
Minneapolis, Des Moines, Detroit, Indianapolis.
F. H. HOPKINS & CO., General Agents for Canada, Montreal, Winnipeg, Vancouver.

BOSTON, 6 Beacon St.
BUFFALO, 4 Builders' Exchange.
CINCINNATI, Merchants Bldg.
CLEVELAND, 505 Bangor Bldg.
DENVER, Mine & Smelter Supply Co.
EL PASO, Mine & Smelter Supply Co.
KANSAS CITY, 710 Victor Bldg.
LOS ANGELES, N. B. Livermore & Co., 1206 Union Trust Bldg.
MEXICO CITY, Mexico Mine & Smelter Supply Co.
NEW YORK, 103 Park Ave.
PHILADELPHIA, Commonwealth Bldg.
PITTSBURGH, Keystone Bldg.
PORTLAND, OREGON, Northwestern Equipment Co., 537Railway Exchange.
SALT LAKE CITY, Mine & Smelter Supply Co.
SAN FRANCISCO, N. B. Livermore & Co.
SEATTLE, Northwestern Equipment Co., 920 Alaska Bldg.
ST. LOUIS, Chemical Bldg.

FOREIGN AGENTS—Buenos Aires: Venge y Cia, Castila Caneo, 1273. Copenhagen: Isidor Heimann & Co. Milan: E. Parodi Delfino.

Austin Improved Cube Mixers

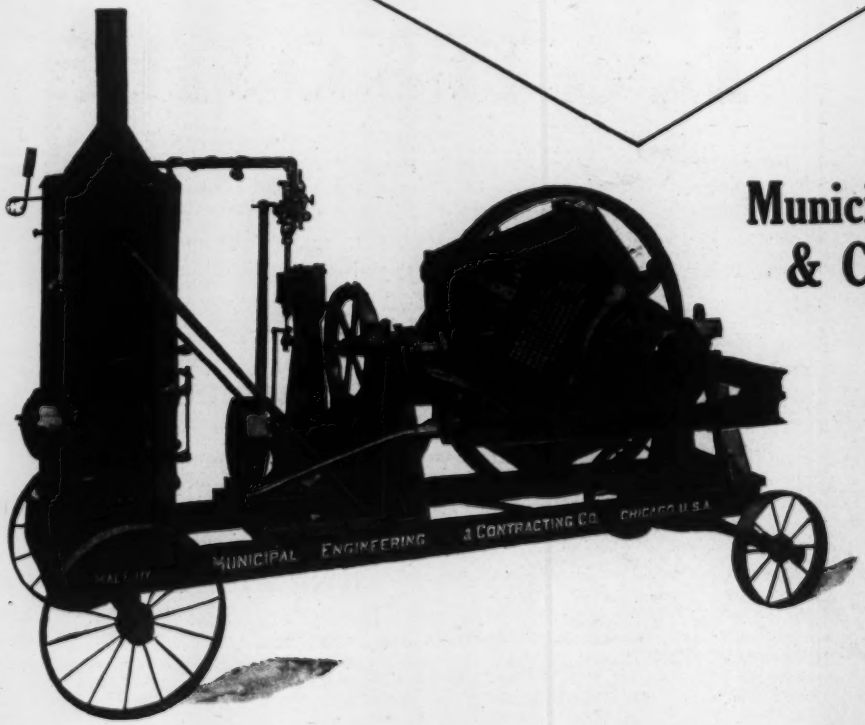
The Cube Does It

The Cube assures the production of high grade concrete—it mixes **as a unit.** There is no tearing apart—disintegrating of cement, rock and sand—but a steady folding over, "batch kneading," that invariably results in an even, strong concrete.

The Cube makes 270 mixing revolutions per minute—the equivalent of turning with 270 shovels. And, with every motion, the **entire** batch is mixed—not just one part of it. This—coupled with ability to stand hard battering—gives the AUSTIN IMPROVED CUBE MIXER its great mixing speed.

The cube is without any kind of fins or blades on the inside. It is perfectly plain—nothing could be more capable of standing the wear and tear to which the drum must be put. It is one of the big points that has won the AUSTIN its wide reputation for steady work.

Get the full story of the Cube and what it does. Just write for Catalog No. 2.



Municipal Engineering & Contracting Co.

Eastern Office:
90 West St., New York City

Main Office:
Railway Exchange Bldg., Chicago

New England Agents—Dyar Supply Co., Cambridge, Mass.

Western Pennsylvania and Eastern Ohio—J. S. Beckwith, Pittsburgh.

Baltimore—Charles A. Dollinger, No. 30 Belair Ave.

Inter-Mountain Dist.—Herbert N. Steinbarger, Denver, Colo.

Pacific Coast—The Lansing Co., San Francisco: The Beebe Co., Portland

AGENTS WANTED IN OPEN TERRITORY

THE BIG HAUSER LAKE DAM

This Great Dam

was built by **Stone & Webster**,—490 feet long, 132 feet high at its deepest part, 85 feet thick at the base with a normal working head of 65 feet. Its construction involved the removal of an earlier failure (in itself a tremendous task) the installation of a diverting dam and temporary flume; the unwatering and excavation of the building site, and the placement of 86000 yards of concrete in the new dam. The work was complicated by the antics of the Missouri river, noted as a "bad actor." The big risks involved made necessary the most careful preparation and adequate equipment. The concrete mixing plant consisted of six machines, one-yard and half-yard capacity, all

SMITH MIXERS

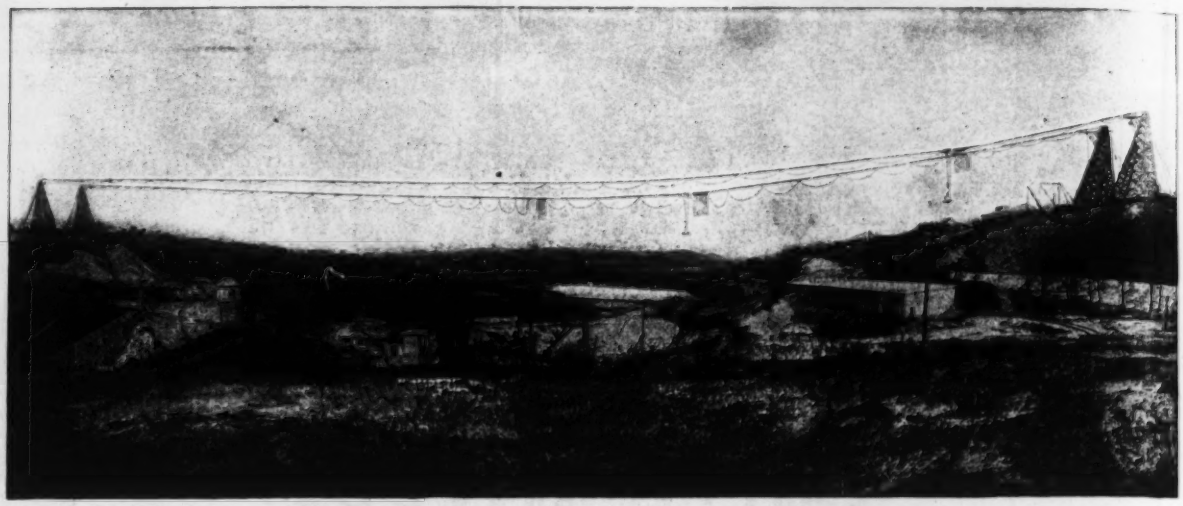
They did the business. They built the dam, delivering concrete in the big volume needed, at a very low cost for upkeep. As usual, they showed the best results under pressure, with the work at a crisis and the whole force keyed to fever pitch. Reliability and durability are easy expressions for the catalog-maker; but in the Smith Mixer they are **built into the machine,** in terms of steel, iron, bronze, engineering, study, experiment and analysis. If you want to **play safe**—if you must **know** that your equipment will stand up at the pinch, get the machine with the tilting dump and the double-cone drum.

At your command—Our Catalog No. 51.

The T. L. Smith Co., 1126 32nd St., Milwaukee

Old Colony Bldg., Chicago **W. J. Cullen, New York**

Flory Cableways and Electric Hoists



Used to Build The Largest Dam in the World

The Flory Cableways illustrated above are being used by H. S. Kerbaugh, Inc., to build the Kensico Reservoir Dam, which is the largest in the world—

Each span is 1861 feet long and of a 10-ton individual load capacity. The main cables are $2\frac{1}{2}''$ diameter locked wire rope and the operating ropes $\frac{3}{4}''$ plow steel. Each span is operated with a 400 H.P. specially designed, electrically driven hoist, and tower-moving devices.

After thoroughly investigating the different cableways, the Kerbaugh Co. awarded the contract for the Flory Cableway, due to quality and extensive experience in suspension cableways.

There are more Flory Cableways in daily operation than all other makes combined. S. Flory Mfg. Co. are the pioneers in cableway work.

On the same project they are now using 19-75 H.P. double drum Flory Hoists and 19 boom swingers electrically operated. The hoists are of special two-speed designs and other mechanical features of value to favor the awardment of the order for Flory Hoist against other strong competition.

Contractors, United States and Foreign Governments are using Flory machinery; on New York Aqueduct, Panama Canal, New York State Barge Canal, Ohio River Improvement, U. S. Reclamation Service, etc.

General and Cableway catalogs will be mailed on request.

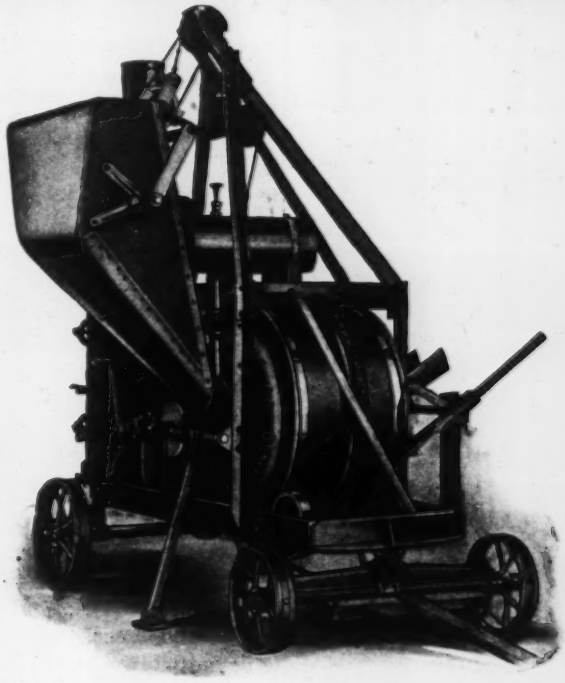
S. Flory Mfg. Co. - - Bangor, Pa.

New York Sales Office: 100 Broadway

OSHKOSH

MIXER

Built to Stand



Special Features:

The Frame heavy, reinforced channel steel.

The Drum thick semi-steel rotated on extra large roller bearings; can be started full or empty.

The Drive trouble-proof chain drive, main sprocket drum rings in sections, each easily replaceable.

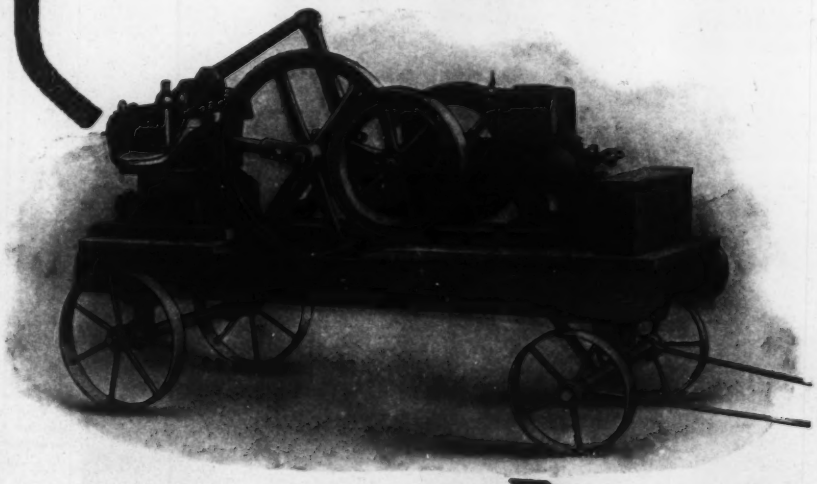
The Mix Quadruple mixing principle employed; turns, kneads, pours, and flows **four times** to each drum revolution.

The Discharge lever can be operated from either side of the machine.

The Oshkosh Mixer is built by practical engineers to furnish a maximum amount of work at the least possible cost. It will be worth your while to know more about it.

Send for descriptive folder.

OSHKOSH



Contractors' Pumps

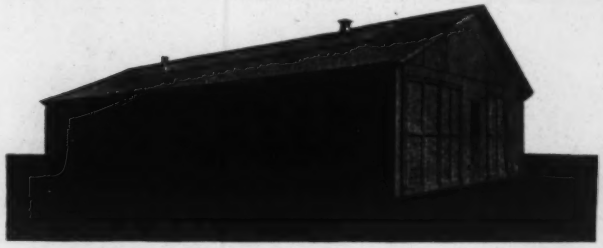
We build a complete line—both trench and centrifugal—for handling all classes of pumping a contractor is called on to do—draining pits, cellars and excavations, irrigation, pumping sewage and sandy water. Strongly built—reliable in operation—and very economical. **Write for details.**

Oshkosh Mfg. Company

360 South Main St., Oshkosh, Wis.

Chicago Office, 1452 Monadnock Building.
New York, Dodge & Dodge, 1133 Broadway.

Portable
Fire-Proof



Permanent
Storm-Proof

Here It Is

A Portable All-Steel Building

Built without wood or other framing

It's the "Prudential"—the portable steel building that is different from any other. Made in unit sections, and put together by a system of telescoping, interlocking and bolting. No wood—no framing of any kind— and not a nail in the entire structure.

Without a question, **The "Prudential" is the strongest portable building of its kind ever designed.**

It is rain-proof, fire-proof, storm-proof, rust-proof and vandal-proof.

The erection of "Prudential" Steel Buildings is very simple—all the parts necessary to complete the building are supplied with each order, and tagged so that the sections may be easily assembled by reference to the detail drawing. A sheet of "Instructions" for erecting is sent to each purchaser, who can with facility, complete the erection within a few hours.

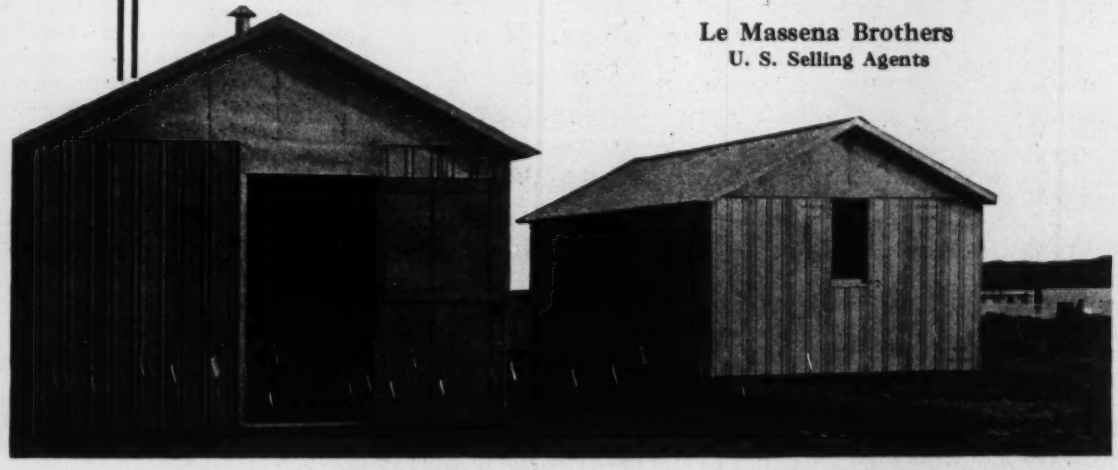
Can be taken down easily and moved from job to job, eliminating the expense of temporary structures.

Cost only 60 to 90c. per square foot of floor area.

Ask us to send you the illustrated Catalog, showing how you can use a "Prudential" for a field office, tool house, bunk house, storage house, pump house, garage, etc.

C. D. Pruden Co., 30 Church St., New York

Le Massena Brothers
U. S. Selling Agents



This Asbestos Corrugated Sheathing Roof on Cast House No. 2 of the Central Iron and Steel Company, Harrisburg, Pa., cost only one-third as much as the Corrugated Iron on Cast House No. 1.

Asbestos Corrugated Sheathing

If you have any interest at all in getting a permanent sheathing or roofing material—note the performance of Asbestos Corrugated Sheathing on the roof of the Central Iron and Steel Company's Cast House No. 2.

Asbestos Corrugated Sheathing is a specialized form of reinforced concrete. It is made of Portland cement, reinforced with interlacing asbestos fibres—corrugated, and then compacted by hydraulic pressure.

To a very high degree, it has all the fire-proof, weather-proof and time-proof qualities for which reinforced concrete is noted.

We shall have more to say about its structural qualities, permanency, adaptability, ease of application, and its economy, in early issues of the *Engineering News*.

In the meantime, if you have any buildings in hand for which sheathing and roofing is needed, send us your data and we will give you specific information.

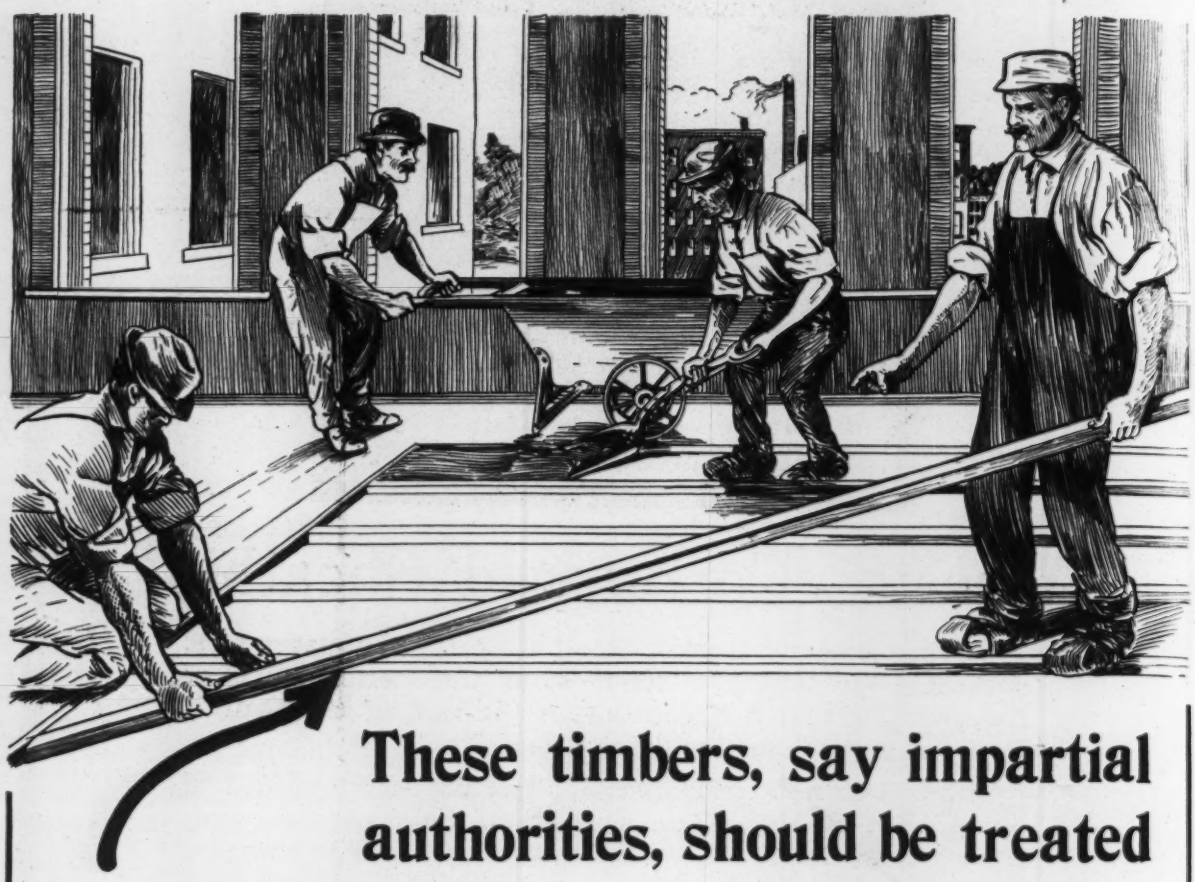
KEASBEY & MATTISON COMPANY, Factors

Ambler, Penna., U. S. A.

COMPARE THE COST OF CORRUGATED IRON ON CAST HOUSE NO. 1

Corrugated Iron Roof No. 1 wore out — and
was replaced with Corrugated Iron Roof No. 2, which wore out — and
was replaced with Corrugated Iron Roof No. 3.

THREE COMPLETE ROOFING BILLS IN FIVE YEARS



These timbers, say impartial authorities, should be treated

THE authorities quoted are no other than the Committee on Buildings of the American Railway Engineering Association. Exactly what they say is this:—

"These (referring especially to sleepers embedded in concrete floors in freight houses) and the plank above them, should be thoroughly treated with creosote or zinc chloride. With untreated timber renewal is sometimes necessary in 4 years."

And what is true of freight houses is equally true of factories and manufacturing plants—with this added. To tear up rotted sleepers in a factory is to throw that section of your plant entirely out of commission.

To the original cost of the new sleepers, the cost of tearing them up and laying the new must be added the cost of days of interrupted operation, idle hands and added machines.

Think it over—and then write us and let us tell you how easily and inexpensively all this can be avoided.

C-A-Wood-Preserver

The most economical of all methods of treatment.

Glad to send descriptive Booklets on request.

C-A-Wood-Preserver Company

56 Liberty St., New York **Wright Bldg., St. Louis**

Chicago Austin, Texas
Salt Lake City—Western Elec. Co.

Indianapolis New Orleans
Denver—Western Elec. Co.

Western Electric Company,
San Francisco Los Angeles

Pacific Coast Selling Agents
Portland Seattle

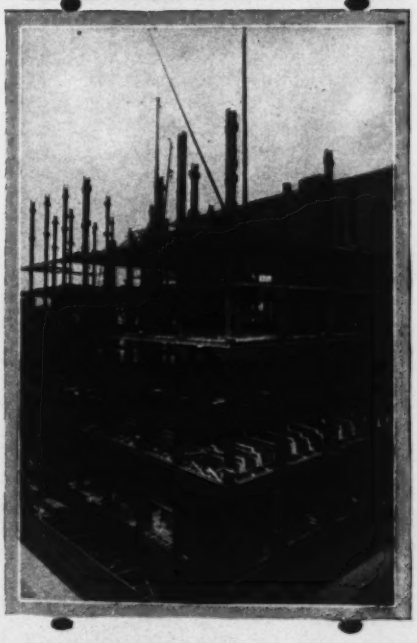
TRADE MARK C-A WOOD PRESERVER REGISTERED U.S. PATENT OFFICE

Latest example of the magnitude of the fireproofing operations executed by this Company

UNION CENTRAL LIFE INSURANCE BUILDING

CINCINNATI, O.

Cass Gilbert & Garber, & Woodward, Associated Architects



THIS gigantic structure, the tallest office building between the Atlantic and Pacific Coasts, is being fireproofed with

TERRA·COTTA·HOLLOW·TILE

manufactured, supplied and set by this Company.

The diversified nature of the structures fireproofed by our materials and methods rests on the high standard of efficiency to which our organization has been developed during the past decade.

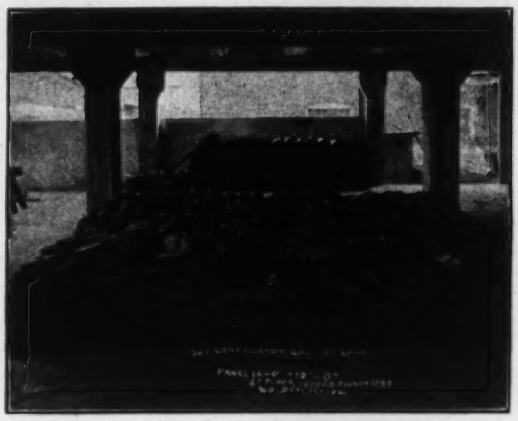
We are ready at all times to furnish complete plans for the solutions of fireproofing problems of any nature, from Shore Bungalows to gigantic Public and Business Edifices.

NATIONAL·FIRE·PROOFING·COMPANY

Organized 1889

PITTSBURGH, PENNSYLVANIA **Offices in All Principal Cities**

A Definite Instance of the Certainty of "Unit" Concrete Construction



A "Unit" Construction floor test—Panel 14 x 16 feet—4-inch floor, 120,000 pound load—

NO DEFLECTION.

EVERY experienced engineer and contractor will readily appreciate the value of **UNIT-BILT** methods of construction as indicated by the following circumstances:

In a building under construction in the West where the **"UNIT"** system was being used, the materials were being furnished by the owner.

During the early progress of the work a certain quality of sand was furnished, which was found entirely satisfactory.

A little later on the owner, through some difficulty in obtaining the quality of sand originally procured, began furnishing us with a different sand, notifying us of the fact and stating that the quality of the new supply was entirely satisfactory to him.

We, of course, proceeded with the work without question, using the new quality of sand furnished, but after a number of units had been cast and seasoned ready for setting, we found that the new sand furnished was actually of such inferior quality that the units cast with it would *not hold together* merely under their own weight.

We immediately destroyed all such units, notified the owner of the situation, and he thereupon furnished a satisfactory quality of sand.

The moral is obvious. If the building had been built by any other than the "UNIT" method, the inferior grade of the new sand supplied could not possibly have been discovered until the forms holding the concrete in place were removed, in which case the results might have been very serious.

Under the "UNIT" method by which the building was constructed the difficulty was, of course, discovered before the units were set in place, thereby eliminating the possibility of later trouble.

This instance is a typical illustration of the *certainty* of results which is insured by the "UNIT" method of construction.

There are many other points of advantage in "UNIT" methods of equal importance, all of which you will find fully explained in our literature, which will be sent upon request.

UNIT BILT

Patented in U. S. and Foreign Countries.

UNIT CONSTRUCTION COMPANY

Engineers and Contractors

724 Chestnut St., St. Louis, Mo.

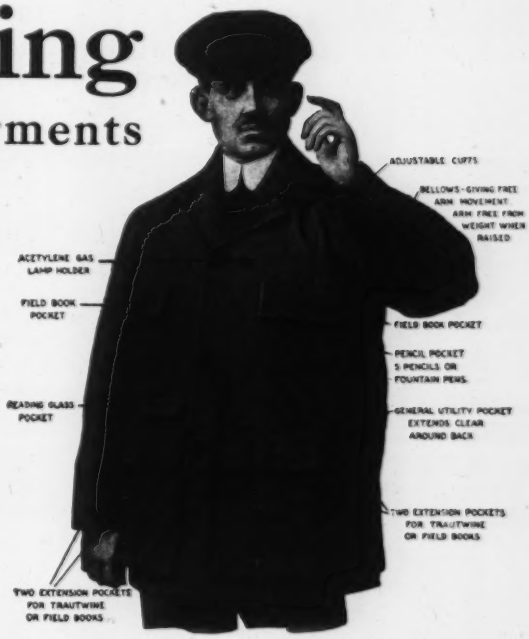
New York Chicago Houston San Francisco Mexico City

Field Clothing

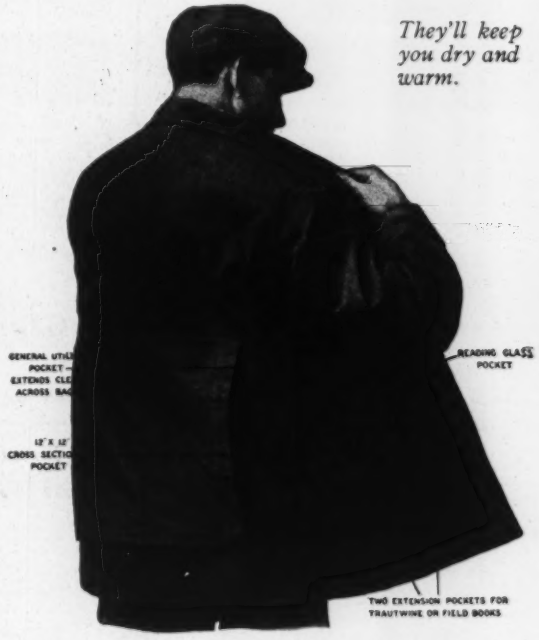
Specially Designed Garments

for

**Civil and Mining Engineers,
Foremen Contractors,
Prospectors, Geologists,
Foresters**


ADJUSTABLE CUFFS
BELLOWS-GIVING FREE ARM MOVEMENT ARM FREE FROM WEIGHT WHEN RAISED
ACETYLENE GAS LAMP HOLDER
FIELD BOOK POCKET
FIELD BOOK POCKET
PENCIL POCKET 5 PENCILS OR FOUNTAIN PENS.
READING GLASS POCKET
GENERAL UTILITY POCKET EXTENDS CLEAR AROUND BACK
TWO EXTENSION POCKETS FOR TRAUTWINE OR FIELD BOOKS
TWO EXTENSION POCKETS FOR TRAUTWINE OR FIELD BOOKS

They'll keep you dry and warm.



Duxbak

TRADE MARK

Cravenetted Field Clothing

Made from our specially prepared Cravenette water repellant cloth. Built particularly for service and utility. 'Twill save your business suit, your time and temper. Most compact garments ever designed.

Send today for this descriptive catalog

It's *yours* for the asking. This catalog fully describes the material and workmanship of these garments.

Made for YOUR special needs and at a price within reason.

Bird, Jones & Kenyon

11 Hickory Street **Utica, N. Y.**

CUT OUT THIS COUPON

BIRD, JONES & KENYON
11 Hickory St., Utica, N. Y.

Please send your Descriptive Catalog to

Name.....

Address.....

State.....

You Can Meet Any Irrigation Pumping Condition With
The "American" Centrifugal Pumps

One of 18 "American" Pumping Stations on lands of The United States Sugar & Land Co., Garden City, Kans.

DEVELOPING Centrifugal Pump design to a science and building regularly over 50 styles of centrifugals enables us to produce a centrifugal of greatest economy for nearly any pumping condition.

This extensive experience in the design of pumps of the centrifugal type has taught us to meet nearly any general or irrigation deep pumping condition in the

"American" Turbine Centrifugal

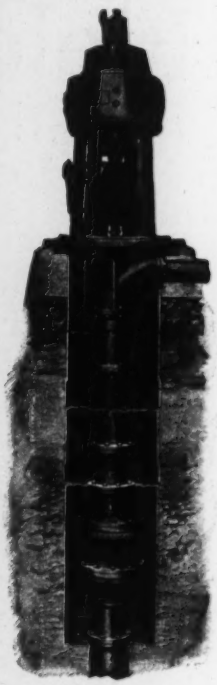
This pump is made in sizes to operate in drill-holes 12 to 30 inches in diameter, produces best results on heads to 150 feet and delivers from 700 to 3,000 gallons of water per minute.

It is operated with vertical type motor, as illustrated, with vertical pulley directly attached to shaft, or with tight and loose horizontal pulley connected with the shaft by bevel gears.

Many of the most successful small irrigation pumping plants in America are now equipped with this type of "American" Turbine Centrifugal.

If you require pumps for any purpose, let us show you why our 43 years' experience in designing and building pumps of nearly every type enables us to produce a pump that will meet your conditions most economically.

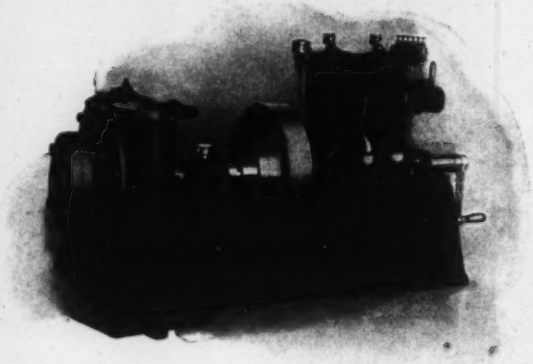
Write for catalog No. 117, the most complete centrifugal pump catalog published.



The American Well Works

GENERAL OFFICE AND WORKS: AURORA, ILL., U. S. A.
Chicago Office: First National Bank Building

Goulds Single Stage Centrifugals Are The Simplest Pumps Made For Elevations Up To 100 Feet.



They have large, open waterways and will handle muddy or gritty water, sewage, oil or other semi-fluid or viscous material.

With a direct connected gasolene engine, as shown, these pumps are just the thing for pumping out excavations, trenches, and for other contractors' services.

By varying the speed of the engine, a large variation in head and capacity can be obtained with this outfit.

Ask for bulletin No. 105.

We want a competent resident agent in every city. Ask for details.

THE GOULDS MFG. CO.

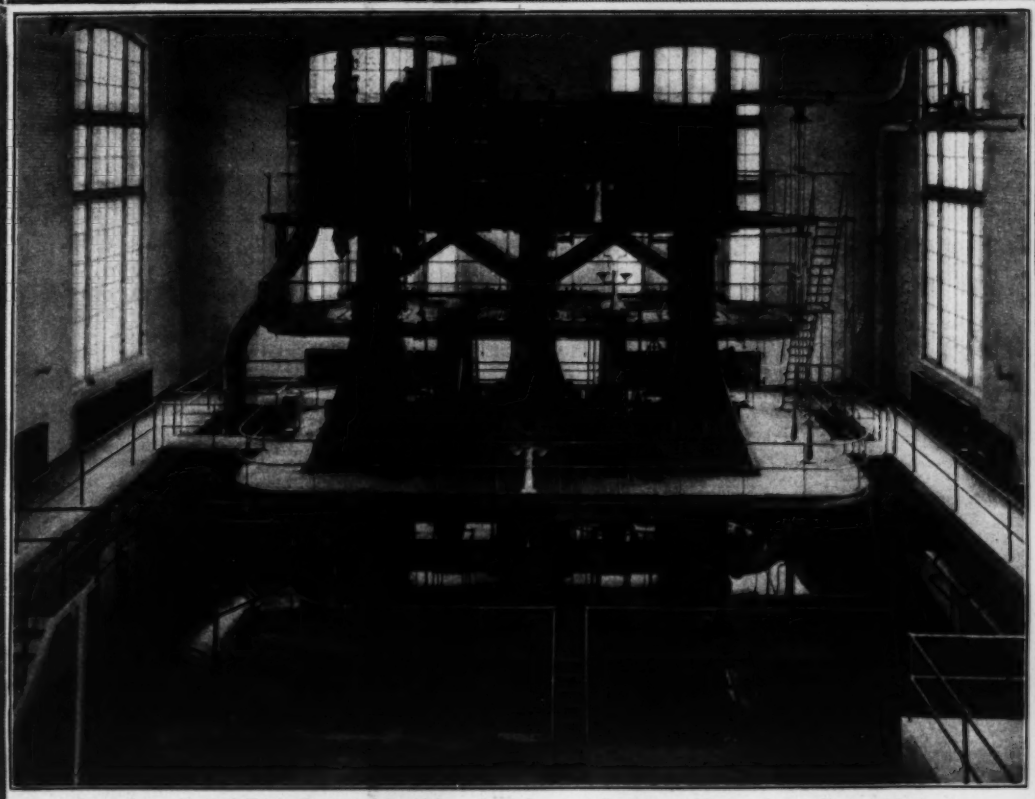
LARGEST MFR. OF PUMPS FOR EVERY SERVICE

19 W. Fall Street **Seneca Falls, N. Y.**

Branches and Agencies in Principal Cities

BETHLEHEM STEEL COMPANY

GAS ENGINES AND PUMPING ENGINES



One of two Vertical Triple Expansion Bethlehem Steel Pumping Engines at Mission Street Station, Pittsburgh.

On official duty test of the above engine, the following record-breaking results were obtained:

Duty per 1,000 lbs. of steam, actual conditions, 201,250,000 ft.-lbs.

Duty per 1,000,000 B. T. U., actual conditions, 160,200,000 ft.-lbs.

Steam per I. H. P. hour—9.59 lbs.

The valve chambers, valve decks and discharge chambers of the water end are made of cast steel.

POWER DEPARTMENT

BETHLEHEM STEEL COMPANY

SOUTH BETHLEHEM, PA.

No Modern Steam Heating System can be successfully operated without a vacuum pump.

The Blake-Knowles Simplex Steam Heating Vacuum Pump

IS, without any qualification, the best machine on the market for this purpose.

Built for Steam or Power Drive.

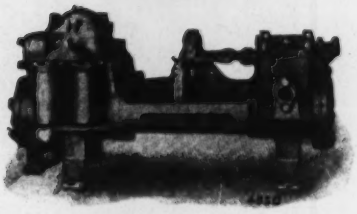
Send for Bulletin BK-877-19.

The Blake & Knowles Steam Pump Works

WORKS: EAST CAMBRIDGE, MASS. New York Office: 115 Broadway

Branch Offices in all Principal Cities. B222.2

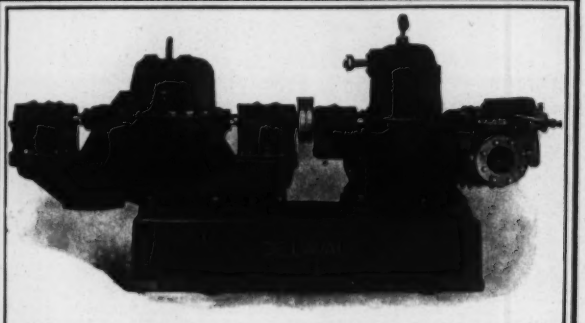
PLATT



"SMITH-VAILE" BOILER FEED PUMP YOKE TYPE BOX

RUGGED — DURABLE — ACCESSIBLE. THE SUCTION VALVES ARE LOCATED IN SEPARATE CHAMBERS AND ARE REACHED BY REMOVING ONE NUT. WATER CYLINDER LINERS CAST SEPARATE; REMOVABLE AND INTERCHANGEABLE. P-12

THE PLATT IRON WORKS COMPANY
DAYTON, OHIO
PUMPS FOR EVERY SERVICE



THE NEW DE LAVAL CLASS "C" TURBINE
IS UNEQUALED FOR DRIVING AUXILIARIES

It is exceptionally simple in construction, the rotating parts consisting only of a shaft, two or three wheels and the governor.

All internal working parts are exposed upon the lifting of the casing cover, which can be done without disturbing the steam or exhaust connections.

After removing the bearing caps the entire rotating member may be taken out of the turbine for examination or repair.

The efficiency of this turbine is high, which coupled with its ruggedness and simplicity makes it the ideal turbine for driving Centrifugal Pumps, Blowers, Generators, etc.

Send for catalogue C41

DE LAVAL
Steam Turbine Co.

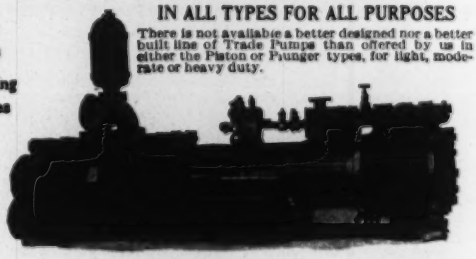
Trenton, New Jersey

76

THE JOHN H. McGOWAN CO., *Builders*
PUMPING MACHINERY
IN ALL TYPES FOR ALL PURPOSES

Water Works Pumping Engines

There is not available a better designed nor a better built line of Trade Pumps than offered by us in either the Piston or Plunger types, for light, moderate or heavy duty.



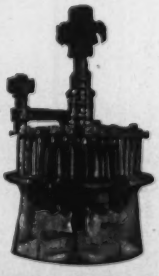
Catalogues 302 and 312 now in preparation will be sent in order of request.

CINCINNATI, OHIO

Drive Your Generator With A Samson Turbine

You can save money if you will use a Samson to drive your generator because the Samson attains a quicker speed than any other turbine operating under the same conditions. This allows the use of lighter and consequently lower priced transmission machinery.

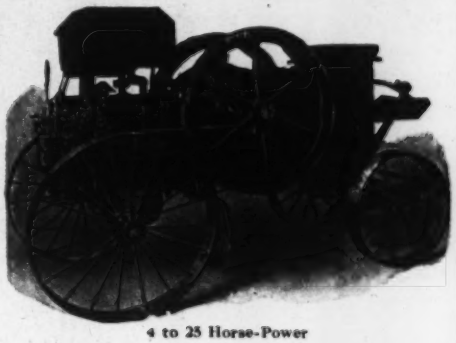
Samson turbines use the water economically; the speed is quick and steady; they develop great power. Write us today.



James Leffel & Co.

302 Lagonda St., Springfield, Ohio

The Mark of Gas Engine Quality



4 to 25 Horse-Power

Portable Gasoline and Distillate Engines

FOR CONTRACTORS' PURPOSES

Otto Portable Engine outfits are built to meet the conditions of contract work where simplicity, reliability and economical operation are of paramount importance. They are highly economical of fuel—require no expert attendance—will withstand hard, knock-about usage—are equal to steady, severe service. The entire outfit, from engine to truck wheels, is of standard Otto quality and backed by the Otto guarantee.

Send for Bulletin 31.

The Otto Gas Engine Works

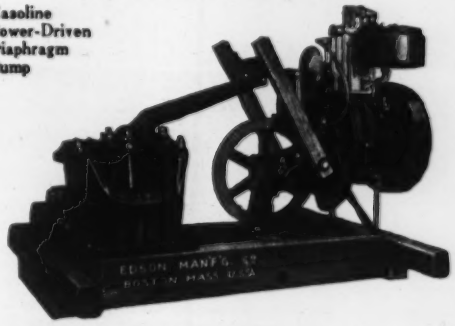
3209 Walnut St., Philadelphia, Pa.

CONTRACTORS' HOISTS CONTRACTORS' PUMPS

Edson Standard—

THE WORLD'S STANDARD

Gasoline Power-Driven Diaphragm Pump



Lightest and Most Compact Sewer-Pumping Outfit on the Market

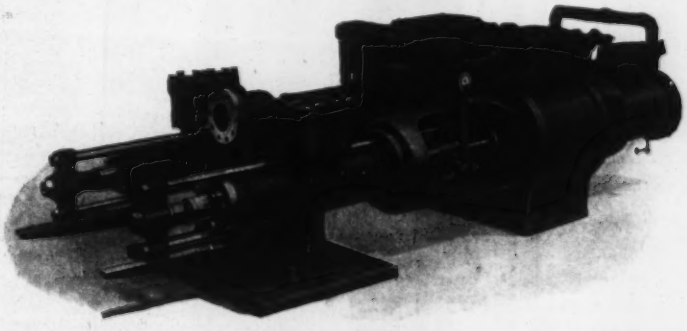
List Price $114.00

We can also furnish outfit mounted on *four-wheel hand Truck* if so desired. Price, $15.00 additional.

Outfit clamps to truck platform, and can be detached or attached as may be most convenient.
In your municipal contracting work, where it is necessary to raise large quantities of water containing mud, sand, grit, gravel, sanitary deposits or any semi-liquid matter, you need this outfit.
In emergency cases, Municipal Water and Sewer Departments, Railroads and Contractors will find this Power Outfit "Johnny-on-the-Spot" and invaluable.
Send us a TRIAL ORDER and become convinced of the ease with which it will handle all troublesome water problems.
Edson Special Suction Hose supplied with above or sold separately—8, 10, 12, 15, 16, 18 and 20 foot lengths carried in stock.

Edson Manufacturing Co.

278 Atlantic Ave. Est. 1859 Boston, Mass.



Pumps and Pumping Machinery

Direct-acting steam pumps—piston and plunger—power pumps, and pumping engines in types and sizes to meet your needs.

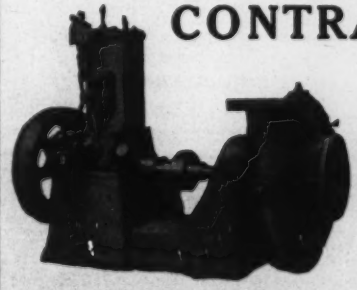
Ask for the bulletins.

National Transit Co.

Oil City, Pa.

A Centrifugal Pump For

CONTRACTORS



This pump, direct connected to a high grade gasoline engine, is rapidly finding favor with contractors. Its principal features, reliable operation and portability, make it hard to beat for draining excavations. Built in 4 to 10 inch sizes, with 10 to 30 foot lift.

Write for further particulars.

LAWRENCE MACHINE CO., Lawrence, Mass.

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Contractor's Mud Pump

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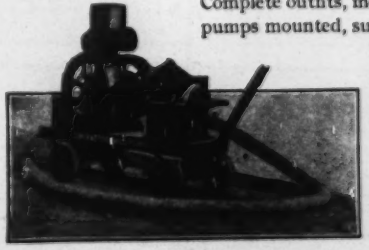

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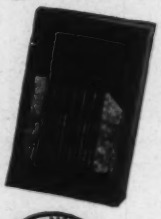

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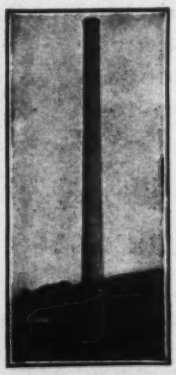

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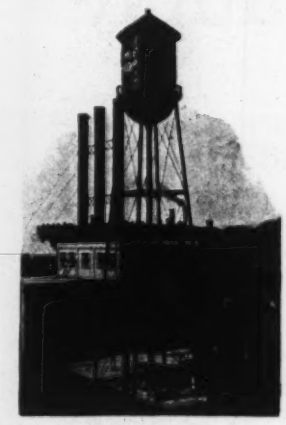

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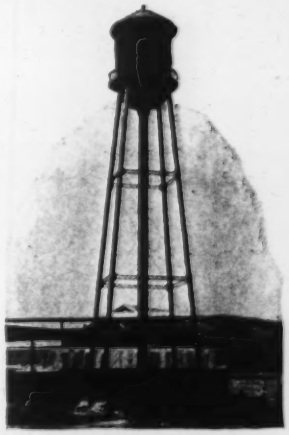

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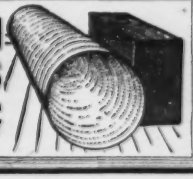

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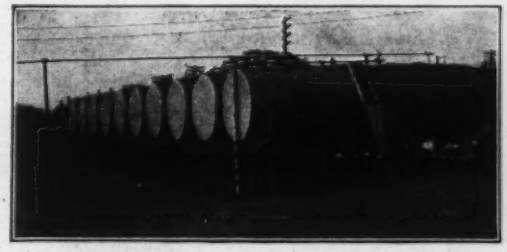

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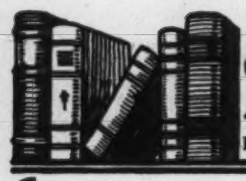

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RAILWAYS

New York—Boston & Albany R.R.—This company, June 14, made application to the Public Service Commission to issue $2,015,000 of bonds for the improvement of its line. F. B. Freeman, Boston, is Ch. Engr.

New York—Dansville & Mount Morris R.R.—This company is considering the construction of its line south so that almost direct communication between Rochester, Hornell and adjacent territory will be established. L. R. Doty, Geneseo, N. Y., is interested. C. C. Hoge, New York, N. Y., is Pres.

Maryland—Rock Castle R.R.—This company has had a survey made for the construction of its proposed line, about 28 miles. J. C. Pence, Westernport, Md., is Const. Engr.

Virginia—Virginia-Carolina R.R.—(Official)—The Callahan Construction Co., Empire Bldg., Knoxville, Tenn., recently awarded contract by this company for 40 miles of its proposed line will soon start work, which comprises considerable cart and car work; also some team work. Contractors desiring to communicate with the company can write to Knoxville, Tenn., and arrangements will be made for them to meet the superintendent at the branch office at Abingdon, Va., who will show them over the work. The entire 40 miles is now ready for construction and work will be let at once. For prices and further particulars, write or wire Callahan Construction Co., Empire Bldg., Knoxville, Tenn. Noted June 19 and May 22.

North Carolina—Hiawasee Valley Ry.—This company will award contracts for grading on its road about July 15. It is proposed to construct a line from Andrews, N. C., on the Southern Ry. via Marble, Peach Tree and Hayesville to Hiawasse, Ga. W. C. Sanderlin is Ch. Engr., Andrews, N. C. Noted May 15.

Mississippi—Ferguson & Palmer Co.—This company, with offices at Paducah, Ky., will build a railroad into timberlands near Houlka, Miss., preparatory to erecting a sawmill. Earl Palmer is in charge.

Mississippi—New Orleans, Mobile & Chicago R.R.—This company is planning to commence work soon on its extension from Beaumont, Miss., into New Orleans. A. F. Church, Laurel, Miss., is Supt.

Louisiana—New Orleans, Mobile & Chicago R.R.—See item under Mississippi.

Tennessee—Yazoo & Mississippi Valley R.R.—(Illinois Central R.R.)—This company is planning to improve its yards at Noconnah, Tenn., at a cost of $600,000. A. S. Baldwin, Chicago, Ill., is Ch. Engr.

Kentucky—Baltimore & Ohio—This company is planning to construct a line along and parallel to the Beaver Creek Branch of the Chesapeake & Ohio R.R. It will be 25 miles long. F. L. Stuart, Baltimore, is Ch. Engr. Noted June 5.

Ohio—Chesapeake & Ohio R.R.—This company has been authorized by the Public Service Commission to issue $377,000 of stock and $380,000 of bonds for the betterment of its lines in the state of Ohio. F. J. Cabell, Richmond, Va., is Ch. Engr.

Kansas—The construction of a railroad from Scott City, Kan., to Fort Dodge, Kan., is under consideration. F. L. Yantis, Scott City, is interested.

Kansas—Kansas City, Kaw Valley & Western R.R.—This company will award contracts for grading about July 1 for its proposed line from Kansas City via Muncie, Kan., Edwardsville, Bonners Springs, Lanape, Loring and Linwood to Lawrence, Kan. There will be a steel bridge about 1000 ft. long across the Kaw River. O. W. Williamson is Ch. Engr., Bonners Springs, Kan.

Kansas—Hutchinson & Northern Ry.—The Public Utilities Commission, June 13, issued a charter to this company. It is proposed to construct a railroad from Hutchinson, Kan., to Fairbury, Neb.

Nebraska—Hutchinson & Northern Ry.—See item under Kansas.

✚**Montana**—Great Northern Ry.—This company has awarded the contract to the WIDELL CO., Mankato, Minn., for the construction of tunnels and bridges in Montana.

Arkansas—The Kentarkark Land & Lumber Co.—This company with offices in the Inter-Southern Bldg., Louisville, Ky., will let a contract soon for the construction of a 10-mile railroad into its timber property in Arkansas.

Texas—Temple, Northwestern & Gulf Ry.—This company will do its own work on its proposed line from Temple to Dublin, Tex. W. E. Dozier, Temple, is Ch. Engr. Noted June 5.

Texas—San Antonio, Uvalde & Gulf R.R.—This company has increased its capital stock from $280,000 to $315,000 for the purpose of raising the necessary money to provide for extensions to its line. The offices of the company will be located at San Antonio, Tex. A. R. Ponder, San Antonio, is Gen. Mgr.

Colorado—Colorado & Northern Ry.—This company is preparing to start work on the construction of its proposed line from Hayden to Cadoma.

New Mexico—El Paso & Southwestern Ry.—See item under Arizona.

New Mexico—The Phelps-Dodge Co. will construct a 15-mile railroad from Tyrone, N. M., to Whitewater, N. M.

Idaho—Chicago, Milwaukee & St. Paul Ry.—This company has sold $999,500 of bonds for the construction of a connection in Idaho and Washington, between the Puget Sound & Willapa Harbor Ry. and its main line. It will be about 30 miles in length. C. F. Loweth, Chicago, Ill., is Ch. Engr.

Utah—Bingham & Garfied Ry.—This company has filed an amendment to its articles of incorporation increasing the capital stock from $2,500,000 to $6,000,000. H. C. Goodrich, Salt Lake City, Utah, is Ch. Engr.

Arizona—San Diego & Arizona Ry.—This company, it is reported, will complete construction of its line to Yuma, Ariz. The sum of $1,000,000 will be spent within a year for the above work. E. J. Kallright, San Francisco, Calif., is Engr. and Acting Supt.

Arizona—El Paso & Southwestern System—The State Corporation Commission of Arizona, June 18, granted permission to this company to consolidate the six companies comprising the system which controls 458 miles of road in Arizona and 440 miles in New Mexico. It is reported that this is preliminary to executing a plan to issue bonds for the extension of the line from Tucson to Phoenix, Ariz. F. B. King, Tucson, Ariz., is Supt.

Washington—Great Northern Ry.—This company will award contracts at once for the construction of its proposed 40-mile line to complete its line to Vancouver, B. C. The work will be carried on from Cold Water summit, to which point the company is now constructing its line. The western end will be at Hope, B. C. A. H. Hogeland, St. Paul, Minn., is Ch. Engr.

Washington—Chicago, Milwaukee & St. Paul Ry.—See item under Idaho.

California—Atchison, Topeka & Santa Fé Ry.—This company has completed surveys, it is reported, for the construction of a direct line from Los Angeles to the Imperial Valley, with a branch to San Diego. The company plans an extension of the Perris branch from Temecula by way of San Luis Rey Valley and Warner's hot springs through the San Felipe Valley to El Centro, Calif. G. W. Harris, Los Angeles, Calif., is Ch. Engr.

Alaska—The Senate Committee on Territories, June 16, ordered a favorable report on a bill appropriating $40,000,000 for the construction, equipment and operation of a railroad in Alaska and giving the President full authority to do the work as he sees fit. The funds are to be raised through the sale of bonds and three-fourths of the gross proceeds of sales from the public domain is to provide a sinking fund for their redemption. Noted June 19.

Canada—Alberta & Great Waterways Ry.—The Canadian Pacific Ry. Co. it is reported, is negotiating for the purchase of this company's line.

ELECTRIC RAILWAYS

North Adams, Mass.—Plans are being prepared by the Berkshire St. Ry. Co. for the improvement of its line from North Adams to Williamstown. C. Q. Richmond, Pittsfield, is Gen. Mgr.

Stafford Springs, Conn.—Preliminary steps are being taken by the Stafford Springs & Monson St. Ry. Co. for the construction of its proposed line from Stafford Springs to the Massachusetts state line. Frederick Faulkner, M. D. O'Connell and Robert H. Fisk, all of Stafford Springs, are interested. Noted Dec. 26, 1912.

Falconer, N. Y.—Surveys have been started for the proposed electric railway to connect Falconer and Buffalo, via Ellington, Clear Creek, Leon, South Dayton, Wesley, Persio, Gowanda and Hamburg, about 55 miles in all. C. D. Meade is interested.

Fredonia, N. Y.—J. Herbert Digby, Dunkirk, N. Y. is interested in the construction of an electric railway from Fredonia to South Dayton.

Rochester, N. Y.—The Rochester & Suburban Ry. Co. contemplates double-tracking and extending its lines in Rochester. E. J. Cook, Rochester, is Gen. Mgr.

Avonmore, Penn.—The West Penn Traction Co. is making preliminary arrangements for the construction of an extension of its Avonmore, Salina & Apollo St. line in Avonmore. W. E. Moore, Pittsburgh, is Gen. Mgr.

Charlottesville, Va.—Surveys are being made for the construction of an electric railway from Charlottesville to Alberene, about 12 miles.

Richmond, Va.—The Virginia Ry. & Power Co. contemplates the extension of its Broad St. line to Roseneath Road. C. B. Buchana, Richmond, is Gen. Mgr.

McMechen, W. Va.—Plans are being prepared by the Wheeling Traction Co. for the extension of its double-track lines in McMechen. George O. Nagle, Wheeling, is Gen. Mgr.

Parkersburg, W. Va.—The Parkersburg, Marietta & Interurban Ry. Co. is considering plans for the extension of its line to McConnellsville, Ohio. H. H. Archer, Parkersburg, is Gen. Mgr. and Pur. Agt.

Augusta, Ga.—The City Council has granted a franchise to the Augusta-Aiken Ry. & Electric Co. to construct and operate an electric railway on Craig St. E. C. Deal, Augusta, is Gen. Mgr.

St. Augustine, Fla.—The Jacksonville & St. Augustine Public Service Corporation has started surveys for the construction of its proposed electric railway to connect St. Augustine and Jacksonville, about 55 miles. Thomas R. Osmond is Gen. Mgr. Noted Feb. 20.

Birmingham, Ala.—The Birmingham Ry., Light & Power Co. has applied for a franchise for the extension of its East Lake line to 87th St. and ultimately to Roebuck Springs. G. H. Harris, Birmingham, is Supt. Ry. Dept.

Nashville, Tenn.—The Nashville Ry. & Light Co. is considering plans for the extension of its line from Nashville to Rock City. H. A. Davis, Nashville, is Supt. Ry. Dept.

Lancaster, Ky.—The construction of an electric railway to connect Lancaster and Richmond is under consideration.

Middletown, Ohio—Preliminary arrangements are being made by the Middletown, Reading & Cincinnati Interurban Ry. Co. for the construction of its proposed electric railway to connect Norwood, Reading, Sharonville, West Chester, Monroe, Middletown and Dayton. George T. Atler is interested.

†Youngstown, Ohio—The Poland St. Ry. Co. has awarded the contract for grading its proposed line from Youngstown to Poland to KANE & SMITH, Youngstown. Noted Feb. 6 and May 1.

Muskegon, Mich.—The Muskegon-Ludington & Manistee Electric Ry. Co. has been incorporated to construct and operate an electric railway from Muskegon to Ludington and Manistee. The incorporators are Thomas Jacobs, Walter Heiston, Henry R. Baldwin and Sidney M. Well, Chicago, Ill., and Charles P. Williams, Washington.

Plans have been prepared by the Muskegon-Casnovia Land & Development Co. for the construction of its proposed electric railway to connect Muskegon, Kant City and Casnovia, about 27 miles. James L. Smith, Muskegon, is Secy. Noted May 1.

Benton, Ill.—According to press reports a company is being organized at Benton for the purpose of constructing an electric railway from Benton to Christopher, Herrin and Johnson City, about 30 miles. D. F. Darnell, Decatur, is interested.

Springfield, Ill.—Plans are being prepared by the Capitol City Park & Amusement Co. for the construction of an electric railway in Zoo Park.

Topeka, Kan.—Plans are being considered by the Topeka Ry. Co. for the extension of its line to Gage Park. A. M. Patton, Topeka, is Gen. Supt.

Corpus Christi, Tex.—The Corpus Christi St. & Interurban Ry. Co. contemplates the construction of two miles of new track. F. C. Headley, Corpus Christi, is Supt.

Dothan, Tex.—Hugh G. Smith, Dothan, is interested in a project to construct an electric railway on West Main St. and through Houston Heights.

Albuquerque, N. M.—E. J. Hall, Albuquerque, is interested in the construction of an electric railway to connect Albuquerque, Bernalillo, Sila, Santa Anna, Alameda, Los Linas and Belen.

Fallon, Nev.—Grading has been started by the Fallon Electric R.R. Co. for the construction of its proposed electric railway to connect Fallon, Stillwater and Harrigan South. C. A. Hascall is Pres. and H. Latten is Ch. Engr.

Raymond, Wash.—The Willapa Harbor Ry. Co. is preparing plans for the construction of an electric railway from Raymond to Menlo. R. L. Fisher Raymond, is Mgr. and Pur. Agt.

Exeter, Calif.—Plans are being considered by the Visalia Electric R.R. Co. for the extension of its line in Exeter. F. W. Webster, Fresno, is Gen. Mgr.

Fresno, Calif.—The Fresno Traction Co. has completed surveys and is making preliminary arrangements for the construction of its proposed electric line to connect Fresno and the San Joaquin River, about 10 miles. F. W. Webster, Fresno, is Gen. Mgr. Noted June 19.

†Los Angeles, Calif.—The Pacific Electric Ry. Co. has awarded the contract for grading its proposed electric line to Upland, to GRANT BROS., Security Bldg., Los Angeles.

Los Angeles, Calif.—Plans are being prepared by the Los Angeles Ry. Co. for the construction of an electric railway on Hill St. in Los Angeles. C. A. Henderson, Los Angeles, is Gen. Mgr. and Pur. Agt.

Sacramento, Calif.—The Northern Electric Ry. Co. will construct a line from this city to Vallejo, a distance of 60 miles. A 10-mile branch from Suisun to Vacaville will also be constructed, this to be extended later to Woodland. A. D. Schindler, San Francisco, is Pur. Agt. and Gen. Mgr.

Berlin, Ont.—Plans are being prepared by the Berlin & Waterloo St. Ry. Co. for double-tracking its line from Wellington St. to the Waterloo lines. T. R. Cumming, Welland, is Ch. Engr.

Dunnville, Ont.—The Council has granted a franchise to the Dunnville, Wellandport & Beamsville Electric Ry. Co. to construct and operate an electric railway in Dunnville.

Niagara Falls, Ont.—Preliminary arrangements are being made by the Niagara Falls, Welland & Lake Erie Ry. Co. for the construction of a one-mile branch on North Main St. to Welland. C. J. Laughlin, Jr., Welland, is Vice-Pres. and Gen. Mgr.

York, Ont.—The construction of an electric railway in York is planned by the Forest Hill Electric Ry. Co.

North Vancouver, B. C.—The Lynn Valley Scenic Ry. Co. is considering plans for the construction of an electric railway through Lynn Valley to Lynn Valley Park. J. P. Crawford is interested.

Victoria, B. C.—The Vancouver Island Hydro-electric & Tramway Co. is making preliminary arrangements for the construction of its proposed electric railway at Ladysmith, Vancouver Island. Montague Yates, Victoria, is interested.

LIGHT, HEAT AND POWER

†Greenfield, Mass.—The Greenfield Electric Light & Power Co. has awarded contract to the S. MORGAN SMITH CO., for the installation of three water wheels at its Gardner Falls station.

Binghamton, N. Y.—Bids will be received by the Board of Contract and Supply until July 2 for the construction of a municipal electric-light plant on Noyes Island. Douglas Sprague, 39 Cortlandt St., New York, is Consult. Engr. Noted Sept. 19.

Hudson, N. Y.—See item under Buildings.

New York, N. Y.—Bids will be received until June 26 by Patrick A. Whitney, Comr. of Correction, for furnishing materials and installing complete electric-lighting plant equipment in the Seventh District Prison, W. 53d St., Manhattan. Bids will be received until June 30 by C. B. J. Snyder, Supt. School Bldgs., New York City, for installing electric equipment in new School 53, Boro. The Bronx.

Schenevus, N. Y.—Plans are being prepared by the Great Bear Light & Power Co. for the construction of a transmission line from East Worcester to Schenevus. W. F. Shupe, Worcester, N. Y., is Mgr. and Supt.

Syracuse, N. Y.—The Syracuse Lighting Co. will expend $100,000 in improving its plant. J. C. DeLong, Syracuse, is Gen. Mgr.

Camden, N. J.—The lowest bid received by the Municipal Electric Light Committee, June 16, for the construction of a municipal lighting plant was that of the Atlantic Construction & Supply Co., Atlantic City, at $413,000, if wires are not laid underground, and $479,300 if they are. Noted Apr. 17.

†West New York, N. J.—The West Shore R.R. has awarded a contract to GEORGE ALLEN & SON, 1245 Park Ave., New York, N. Y., for rebuilding of the boiler and economizer settings at the Weehawken power station.

Leighton, Penn.—Plans are being prepared by the Parryville Gas Co. for the construction of a gas plant and system in Leighton.

Williamsburg, Penn.—Plans and specifications have been completed for the construction of a one-story brick and steel power plant to be 150x180 ft., at Williamsburg, for the Pennsylvania Central Light & Power Co., of Altoona. Bids are being received by Day & Zimmerson, Archs., Philadelphia. Noted June 12.

Chattanooga, Tenn.—The Chattanooga & Tennessee Power Co. will erect an auxiliary plant to develop 25,000 hp. W. E. Boileau, Chattanooga, is Gen. Mgr.

Lexington, Ky.—Press reports state that the Transylvania University contemplates the installation of a $50,000 electric-lighting and heating plant in connection with the institution. R. H. Crossfield is Pres.

Cincinnati, Ohio—See item under Buildings.

Ripley, Ohio—The city contemplates the purchase and improvement of the gas and electric plant of the Ripley Gas Light & Coke Co.

Bluffton, Ind.—The city has been granted permission by the Public Utility Commission to issue $20,000 of bonds for the improvement of the municipal electric-light plant. Noted June 19.

†Fort Wayne, Ind.—The Fort Wayne & Northern Indiana Traction Co. has awarded the contract for the construction of an addition to its Spy Run power plant to the ADAMS CONSTRUCTION CO., Chicago, Ill., at $25,000.

Rockford, Ill.—Bids will be received by the city until June 26 for the installation of an ornamental lighting system. E. A. Wettergren is City Clk.

†De Pere, Wis.—The contract for the new lighting system to be installed here has been awarded to the DE PERE ELECTRIC LIGHT & POWER CO.

Neshkoro, Wis.—The Neshkoro Light & Power Co. is making preliminary arrangements for the construction of an electric-light and power plant at Neshkoro. C. T. Dahlke is Engr.-in-Charge.

Early, Iowa—The proposition to issue $7000 of bonds for the construction of a municipal electric-light plant is under consideration.

East Peru, Iowa—The Peru Electric Light & Power Co. has been granted a franchise to construct and operate an electric-light plant and system at East Peru. F. A. Herweke is Supt.

Lyons, Iowa—The Commercial Club is considering plans for the installation of an ornamental street-lighting system.

Monona, Iowa—A franchise has been granted by the City Council to Wellman & Son to construct and operate an electric-light plant at Monona. Noted May 29.

†Anoka, Minn.—The State Board of Control has awarded the contract for alterations and additions to the power plant at the Anoka Asylum for the Insane, including boiler stokers, pumping machinery and piping, to J. P. ADAMSON & CO., St. Paul, at $23,678.

Detroit, Minn.—Bids will be received by the city until July 7 for the installation of an ornamental lighting system on Washington and Pioneer Sts. E. J. Bestick is City Clk.

Ellsworth, Minn.—At a recent election the citizens voted to issue $8000 of bonds for the construction of a municipal electric-light plant.

Lake Park, Minn.—The proposition to issue bonds for $10,000 for the construction of an electric-light plant is under consideration. Ira Shannack is Clk.

Onamia, Minn.—The citizens are considering the proposition to issue bonds for the construction of a municipal electric-light plant.

Windom, Minn.—An election will soon be held at which the proposition to issue $15,000 of bonds for the improvement of the municipal electric-light plant and water system, will be submitted to the voters.

Wood Lake, Minn.—The Council is considering plans for the construction of an electric-light plant at Wood Lake.

Wilber, Neb.—Preliminary arrangements are being made and bids will soon be received for the construction of a municipal electric-light plant. O. C. Martz, Lincoln, Neb., is Consult. Engr. Noted June 5.

Frankfort, S. D.—Preliminary arrangements are being made and bids will soon be received for the installation of an electric-light system at Frankfort.

Belfield, N. D.—Press reports state that the construction of an electric-light plant at Belfield is under consideration.

Mott, N. D.—Plans are being considered by S. Stewart for the installation of an electric-light plant in connection with his establishment at Mott.

Waldron, Rrk.—S. J. Hill and W. P. Harris are planning for the construction of an electric-light plant at Waldron. Noted May 29.

Denison, Tex.—According to press reports the Texas Power & Light Co. contemplates the construction of a new power plant on the Red River, near Denison. Estimated cost, $750,000. W. B. Head is Vice-Pres.

Waelder, Tex.—Preliminary steps are being taken for the construction of an electric-light plant and ice factory at Waelder.

Westboro, Tex.—Plans are being considered by the city for the construction of a municipal electric-light plant. J. C. Jones is City Secy.

Santa Fé, N. M.—It is reported that a syndicate of Chicago, Ill., men has taken over the projected White Rock Cañon hydro-electric project which was being promoted by Charles M. Lang, Salt Lake City, Utah, and associates. It is planned to build a dam across the White Rock Cañon and construct a large hydro-electric plant. A system of power transmission lines will also be built, running to Albuquerque, Santa Fé, Las Vegas and several other places.

Downey, Idaho—The Utah Light & Power Co. has been granted a franchise to construct and operate an electric-light plant and system at Downey.

Park City, Utah—Louis A. Jeffs is contemplating the construction of an electric-light plant in Park City.

Colville, Wash.—The Stevens County Power & Light Co. is making preliminary arrangements for the construction of a substation at Colville and one at the United Copper Mine near Chewelah. H. R. Williams, Colville, is Vice-Pres. and Gen. Mgr.

Warden, Wash.—Preliminary arrangements are being made by the Washington Water Power Co. for the extension of its transmission lines into Hartline.

✚Arlington, Ore.—(Official)—Bids were received by the city, June 3, for constructing an electric-light plant and pumping station as follows: (a) power house; (b) engines, generator, etc.; (c) filter; (d) electrical distribution system; E. O. Hall, Hood River, (a) $1793; (d) $1810; R. R. Poppleton, Portland; (d) $2550; H. W. LANG, Arlington; (a) $1750, (awarded contract); NePage, McKenney & Co., Seattle, Wash.; (a) $1650; (b) $5368; (d) $1339; Dennis & Christensen, Portland; (a) $1650; (b) $5195; (d) $1475; CALIFORNIA JEWELL FILTER CO., San Francisco, Calif.; (c) $2506 (awarded contract); FAIRBANKS, MORSE & CO., Portland, (b) $5125; (d) $1375, (awarded both contracts). Louis C. Kelsey, Portland, is Consult. Engr. Noted Aug. 8, 1912.

✚Long Beach, Calif.—The contract for the installation of an additional unit at the steam power plant of the Southern California Edison Co., has been awarded to the F. O. ENGSTROM CO., Fifth and Seaton Sts., Los Angeles, at about $1,000,000.

Porterville, Calif.—The Mount Whitney Power Co. has prepared plans for the construction of a substation at Fourth St. and Putnam Ave., Porterville.

Reedley, Calif.—A. A. Weber and R. W. Wilson, of the Alta District Gas Co. have applied for a gas franchise and will erect a plant at once if it is granted.

San Diego, Calif.—The San Diego Gas & Electric Co. plans to spend $459,000 for extensions. C. C. May, San Diego, is Pur. Agt.

✚San Francisco, Calif.—The City Electric Co. has awarded a contract at $7742 to BLUXOME & CO., for the erection of a reinforced-concrete substation on Post St., near Polk St. W. A. Clark is Engr.

✚Venice, Calif.—The contract for the installation of an ornamental street-lighting system in the canal district has been awarded to the SOUTHERN CALIFORNIA ELECTRIC CO., at $17,738.

Visalia, Calif.—The Mt. Whitney Light & Power Co. is preparing plans for the Tuolumne Light & Power Co. project. A reservoir will be constructed on the Tuolumne River and a power plant will be erected below Groveland. The project will cost about $2,000,000.

Point Rouge, Que.—Plans are being prepared for the installation of additional equipment in the local electric-light plant. Charles A. Julien is owner.

Kamloops, B. C.—J. J. Carment Engr. is preparing plans for a new $260,000 hydro-electric plant to be located on the Barriere River near Kamloops.

Summerland, B. C.—The installation of additional equipment in the municipal electric-light plant is under consideration.

BRIDGES

Glens Falls, N. Y.—(Official—Plans are in preparation but a special election must be held regarding the construction of the proposed concrete bridge across the Hudson River. Howard M. West is City Engr. Noted June 19.

✚Dover Furnace, N. Y.—The New York Central & Hudson River R.R. Co. has awarded the contract to E. H. BROWN, Hempstead, N. Y., for the reconstruction and relocation of Bridge H-108 at Dover Furnace.

Herkimer, N. Y.—(Official)—The citizens have voted against the construction of the proposed bridge over West Canada Creek to cost $65,000. B. R. Haile is Town Clk. Noted June 12.

✚Rochester, N. Y.—The contract has been awarded to the JOBSON-GIFFORD CO., 70 East 42d St., for the erection, including the painting, of the steel superstructures for Bridges 701, Hudson Ave., 702, Chatham St., 703, Joseph Ave., and 705, Clinton St., for the New York Central & Hudson River R.R. at Rochester.

Watertown, N. Y.—The taxpayers, June 11, voted against the construction of the proposed three bridges.

✚New York, N. Y.—The contract has been awarded to the THEO. SMITH & SON CO., foot of Essex St., Jersey City, N. J., by the New York Central & Hudson River R.R. Co. for the manufacture and delivery of rail seat and lock and rerailing device for Bridge No. 127, Hudson Division, and joint bars and machinery for Bridge No. 8, River Division.

Clarion, Penn.—Bids will be received by the Board No. 1 of Road Supervisors of Beaver Township, Clarion County, until July 1, for a concrete arch, or an iron bridge, 65-ft. span, capacity 25 tons, with concrete abutments, at Beaver Furnace on Deer Creek. G. E. Coulter is Secy.

Indiana, Penn.—Bids will be received by the Commissioners of Indiana County, until July 7, for a reinforced-concrete bridge across Crooked Creek, Rayne Township, Indiana County.

✚Harrisburgh, Penn.—The contract has been awarded by the state to the JAMES O. LORD CO., Hastings, Penn., for the construction of a bridge over Mahoning Creek at Mack's Fording, Armstrong County, at $11,995. List of bidders noted June 19.

Mercer, Penn.—Bids will be received until July 7 by the County Commissioners of Mercer County, Mercer, for stone or concrete abutments for various bridges.

★Uniontown, Penn.—Bids will be received by the Controller of Fayette County and by the Controller of Washington County, until noon, July 9, at the Office of the Commissioners of Fayette County, Uniontown, for the construction of piers, foundations, etc., necessary in the building of a steel bridge, viaduct and approaches, over the Monongahela River, between South Brownsville and West Brownsville. Plans, specifications and other information are on file at the offices of the Controllers and the Commissioners of Fayette County and Washington County, where they may be seen by all parties interested. The same can be obtained from George Porter, Engr. for Fayette County, Uniontown, Chaney & Armstrong, Engrs. for Washington County, Penn., or Hermann Laub, Consult. Engr., Pittsburgh, upon application from a bona fide bidder accompanied by a deposit of $20, which will be returned after the contract is made.

Washington, Penn.—Bids will be received until July 7 by John H. Moffit, County Controller, Washington, for the purchase of $100,000 of Washington County Brownsville bridge bonds.

Crowley, La.—The Police Jury of Acadia Parish has authorized the erection of a 1500-ft. bridge over Bayou Que de Tortue on the public road from Crowley to Gueydan. Work on the bridge will be rushed, as it is to be completed in time to permit wagons to cross when hauling of the rice crop commences in the early fall.

✚Baltimore, Md.—The contract has been awarded by the Board of Awards, to the STEWART-JONES CO., Rock Hill, S. C., and CLAIBORNE, JOHNSON & CO., 901 Calvert Bldg., Baltimore, for the masonry work in connection with bridge No. 2 to be built over Gunpowder River near Lock Raven, 900 ft. long, under the supervision of the Water Board, at $26,235.

✚The contract has been awarded by the State Road Commissioners Garrett Bldg., Baltimore, to ELKAN-TUFT CONSTRUCTION CO., Lexington and Jones Falls, Baltimore, for the construction of a concrete bridge spanning Gwynn's Falls, and Western Maryland Ry. at Frederick Ave., at $54,000 for the bridge and $14,696 for wings, to be constructed after plans prepared by the Commissioners Engineers.

Memphis, Tenn.—The name of the company receiving the contract for the construction of the substructure of the bridge across the Mississippi River at Memphis was erroneously noted June 12 as the Union Bridge & Iron Co. instead of the Union Bridge & Construction Co. The officers of the company are in the Sharp Bldg., Kansas City, Mo.

Chillicothe, Ohio—(Official) — Plans have been prepared and are being considered for the construction of the new Main St. bridge. The plans call for five additional spans of 150 ft. each. The bridge which now spans the river, will be raised about four ft. The entire structure complete will cost about $100,000. G. M. Anderson is County Engr. Noted May 22.

Colerain, Ohio—Bids will be received by the Board of Commissioners of Hamilton County until noon, June 27, for the repair of the approach to the bridge on Harrison Ave., over the Great Miami River at Colerain. Albert Reinhardt is Clk. of Bd.

✚Dresden, Ohio—The County Commissioners have awarded the contract for the construction of a bridge at Dresden to E. M. SCULLY, at $32,300.

Kings Mills, Ohio—The Board of County Commissioners of Warren County, Lebanon, contemplate the construction of a two-span high-truss steel bridge over the Little Miami River at Kings Mills.

Lagrange, Ohio—Bids will be received by the Board of Commissioners of Lorain County until 1 p.m., June 30, for the construction of the superstructure of the Freeman Bridge No. 5, near Lagrange. F. L. Ellenberger is Clk. of Bd.

Marietta, Ohio—The City Council has authorized a bond issue of $120,000 for the purpose of rebuilding the Putnam St. bridge.

New Baltimore, Ohio—Bids will be received by the Board of County Commissioners of Hamilton County until noon, June 27 for the construction of the superstructure of the

new bridge over the Great Miami River at New Baltimore. Albert Reinhardt is Clk. of the Bd.

✚Springfield, Ohio—(Official)—The Board of County Commissioners of Hamilton County, Cincinnati, has awarded the contract for the alterations to the lift bridge over the Miami River and Erie Canal at Section Ave., Springfield, to O. D. CURRY, 2525 Ashland Ave., Cincinnati, at $21,000. Bids were received June 13. Noted May 22.

Bids will be received by the Board of County Commissioners of Hamilton County until noon, July 11 for the construction of a concrete culvert on German Road in Springfield. Albert Reinhardt is Clk. of the Bd.

Sycamore, Ohio—Bids will be received by the Board of Commissioners of Hamilton County, Cincinnati, until noon, July 18, for the construction of the superstructure of the bridge at Clark and Davis St., over the East Fork of Millcreek. Albert Reinhardt is Clk. of Bd.

Troy, Ohio—Bids will be received by the Commissioners of Miami County until 2 p.m., July 15, for substructures and steel superstructures of the following bridges: Bridge over Still water River at West Milton; bridge over Stillwater River on Troy and West Milton Pike; bridge over Stillwater River at Sugar Grove; bridge over Ludlow Creek at Ludlow Falls; bridge over Greenville Creek one mile west of Covington; bridge over Miami River on Lockington Pike; repair of bridge over Miami River at North Main St., Piqua; bridge over Stillwater River at Bridge St., Covington.

Venice, Ohio—Bids will be received by the Board of County Commissioners of Hamilton County, Cincinnati, until noon, June 27, for the construction of the west approach to the highway bridge over the Great Miami River near Venice. Albert Reinhardt is Clk. of Bd.

✚Ottawa, Ill.—(Official)—The contract for the construction of a reinforced concrete bridge in Serena Township has been awarded to GEORGE E. QUINLAN, 1321 East 53rd St., Chicago, Ill., at $3712. Noted June 12.

Wilmington, Ill.—The County Board has authorized the construction of a $60,000 bridge. Nicholas Engles is County Superv.

Madison, Wis.—The Assembly has approved of a bill appropriating $50,000 to assist the residents of Sauk and Columbia counties to build a bridge over the Merrimac river.

Carson, Iowa—The Board of Supervisors will erect a 120-ft. span bridge across the Nishnabotna River. The estimated cost is $5000.

✚Hutchinson, Kan.—(Official)—The contract for the construction of a concrete bridge at First Ave., West, and another at Ave. B. East, has been awarded to the ST. JOSEPH CONSTRUCTION CO., Hutchinson, Kan., at $14,700. Noted June 12.

Newton, Kan.—(Official)—Bids will be received until July 1, by Miss Adella Martin, City Clk., for the construction of a concrete bridge on Main St. The estimated cost is $12,000. W. S. Gearhart, is State Highway Engr. Noted June 5.

Great Falls, Mont.—(Official)—Bids will be received until June 26, by Lee Dennis, County Clk., Cascade County, at Great Falls, Mont., for the construction of a bridge over the Missouri River at Elm. The estimated cost is $40,000. Noted June 12.

✚McAlester, Okla.—(Official)—The contract for the construction of three bridges for Pittsburg County has been awarded to the MISSOURI BRIDGE & IRON CO., St. Louis, Mo., at $8148. W. S. O'Neal is County Clk. Noted May 22.

✚Idaho City, Idaho—The contract has been awarded to the MISSOURI VALLEY BRIDGE & IRON CO., Leavenworth, Kan., for the construction of two steel highway bridges and reinforced concrete retaining wall at the North fork of the Payette River. The first bridge will cost approximately $5000. Bidders for the other bridge were as follows: Missouri Valley Bridge & Iron Co., $9214; Minnesota Steel & Machinery Co., $12,797; Colorado Bridge & Construction Co., $11,521; James J. Burke & Co., Salt Lake City, $15,000; J. H. Forbes & Co., Caldwell, Idaho, $10,341; Security Bridge Co., Minneapolis, $11,998.

✚Moscow, Idaho—(Official)—The contract for the construction of two steel bridges for Latah County, has been awarded to the SECURITY BRIDGE CO., Minneapolis, Minn., at $7385. Noted June 5.

Salmon, Idaho—Bids will be received by the County Commissioners of Lemhi County, Idaho, until July 15, for renewing timber members in two combination Pratt truss-bridges.

✚Republic, Wash.—The contract for the construction of a bridge across the San Poil River at Cache Creek has been awarded to H. H. STRATTON, 2325 Sinto Ave., Spokane.

Seattle, Wash.—The lowest bidder for the construction of 20th Ave. N. E., bridge was J. R. Wood, 621 Valley St. at $41,028. Other bidders were as follows: Nettleton-Bruce-Sschback, $41,726; Graff Construction Co., $43,737; International Contract Co., $44,733; Russell & Gallagher, $47,497, and Harrington-Peters Co., $49,223. It is probable that J. R. Wood will be awarded contract.

✚Independence, Ore.—The County Court has awarded the contract for the construction of a concrete bridge to PURCELL & GALLAGHER, Portland, Ore.

Portland, Ore.—(Official)—All bids received for the construction of a reinforced concrete bridge over Sullivan Gulch, have been rejected and the project will be discontinued. Thomas M. Hurlburt is City Engr. Noted June 5.

Los Angeles, Calif.—Bids will be received by the Board of Supervisors until 2 p.m., June 30, for the construction of four trestle bridges over the Laguna Wash on University Ave., Hubbard Ave., Sunol Drive and First St., in the Alhambra and Fruitland Road Districts.

Dedding, Calif.—Plans have been accepted by the City Trustees for a reinforced concrete bridge to be built across the Sacramento River. The bridge will be twenty one ft. wide, and 800 ft. long. The piers will rise sixteen ft. above the highwater mark. The estimated cost is $45,000. Noted June 5.

San Jose, Calif.—Wm. Radtke, of Gillory, was the lowest bidder for the construction of a concrete bridge near San Jose. Other bidders were as follows: John W. Williams, San Jose, $12,000; M. E. Kilcourse, San Jose, $11,432; T. K. Bell, Modesto, $10,856; State Construction Co., San Francisco, $11,289; A. W. Beggers, S. F., $13,937; R. O. Summers, San Jose, $14,845. The engineer's estimate was $11,200. Plans were also ordered for two new bridges to cost about $25,000 and $8,000. Irving L. Ryder, Engr., San Jose, Calif.

Ventura, Calif.—Bids will be received until 2 p.m., July 8, by the County supervisors for the construction of seven reinforced concrete bridges and culverts in the Conejo Valley.

WATER SUPPLY—IRRIGATION

Portland, Maine—According to press reports, the Trustees of the Water District contemplate the installation of a plant to treat the water taken from Sebago Lake with a solution of hypochlorite. J. M. Caird is Engr.

✚Brownington, Vt.—According to press reports, the Orleans Water Works Co., Orleans, Vt., has awarded a contract to the H. P. CUMMINGS CO., Ware, Mass., for laying 24,000 ft. of 6-, 8- and 10-in. c.-i. water pipe, and constructing a concrete dam, intake and gate house at the outlet of Willoughby Lake. Dudley & Sawyer, Manchester, N. H., are Consult. Engrs.

★Agawam, Mass.—(Official)—Bids will be received by the Board of Water Commissioners until 2 p.m., July 2, for hauling and laying 90,000 ft. of 4-, 6- and 8-in. c.-i. pipe. Plans and specifications are on file at the office of James L. Tighe, Consult. Engr., 189 High St., Holyoke, Mass. E. A. Kellogg is Chn.

East Longmeadow, Mass.—Bids will be received by the Board of Selectmen until 2 p.m., July 8, for furnishing and laying about 10,500 ft. of 78-in. and 15,600 ft. 6-in. c.-i. water pipe with necessary hydrants, and gates. Plans and specifications are on file at the office of Durbee, White & Towne, Engrs., Springfield, Mass. T. C. Burton is Chn, of Selectmen.

✚Fall River, Mass.—The Water Board has awarded the contract for setting boilers and making alterations and additions to the boiler house at the pumping station to WILLIAM A. BORDEN at $10,500.

Foxboro, Mass.—The Board of Water Commissioners contemplates laying about 14,000 ft. of 8- and 6-in. pipe from Foxboro to Foxdale. Estimated cost, $15,000. W. R. Lewis is Secy.

Worcester, Mass.—The City Council Committee on Water has ordered installation of water pipe in various streets as follows: 2250 ft. 2-in., 1100 ft. 8-in., 5650 ft. 12-in., 1100 ft. of 16-in. Cost, about $22,000 George W. Batchelder Water Comr.

Brooklyn, N. Y.—Bids for laying water mains in various streets were received by Henry S. Thompson, Comr., Water Supply, Gas and Electricity, June 13, as follows: Robert Carter Co., Brooklyn, $19,002; Beaver Engineering & Contracting Co., 51 Chambers St., $20,964; Tam Corp., 11 East 125th St., N. Y. City, $20,709; Carragno & Dragonetti, 1178 Clay Ave., $18,733; Murphy Bros., Brooklyn, $20,844; J. O'Leary, 245 East 202d St., $20,939; L. D. Gregory, 212 West 138th St., $18,883; McBride & Callan, 670 Eighth Ave., $19,568; Hanover Contracting Co., 215 West 125th St., $20,471.

★Lockport, N. Y.—(Official)—Bids will be received by Schuyler Beattie, City Clk., until 7:30 p.m., July 9, for constructing a 12-in. watermain in Willow St., Beattie Ave., High St., Hyde Park, Mulberry St., Pound St. and Walnut St., according to plans and specifications on file at the office of the City Clerk. Noted June 12.

Paterson, N. J.—The Mayor and City Council have approved an election for voting on a bond issue of $10,000, to be used for extending the water system. H. J. Harder is City Engr.

✚Danville, Penn.—(Official)—The contract to construct a settling basin, furnish and install new pumping machinery, and make connections with the pumping station of the city water system, has been awarded to the PITT CONSTRUCTION CO., Pittsburgh, Penn. Bids were opened by the Board of Water Commissioners, May 20. Chester & Fleming, Pittsburgh, are Consult. Engrs. Noted May 8.

Morganza, Penn.—(Official)—R. Winthrop Pratt, Consult. Engr., Hippodrome Bldg., Cleveland, Ohio, has been retained to supervise the construction of a water-works dam for the Pennsylvania Training School at Morganza. William F. Penn is Supt. of School.

Shippensburg, Penn.—The borough contemplates an expenditure of $50,000 for enlarging its water system.

Ashland, Va.—(Official)—The proposition to purchase the holdings of the Ashland Gas, Sewerage & Water Co. was voted down at the recent election. Noted June 19.

✚Norfolk, Va.—According to press reports, a contract to furnish water meters during the year, has been awarded by the Board of Control, to the NATIONAL METER CO., Norfolk, at approximately $20,000.

Richmond, Va.—Preliminary plans and estimates have been prepared for laying a 12-in. watermain in Broad St., to supply water to the Fulton Hill District. E. E. Davis is Supt. W.-Wks.

Vinton, Va.—The project to install a municipal water system here has been favorably acted upon, and bonds for $25,000 have been voted for the purpose. Noted Feb. 6.

Barboursville, W. Va.—The proposition to install a municipal water system here will come up for a vote July 9. Tentative plans and estimates place the cost of a system at $12,500.

Parkersburg, W. Va.—Plans have been prepared for laying an 8-in. watermain across the Little Kanawha River, to serve the South Side. Estimated cost, $8000. B. F. Stewart, Jr., is City Engr.

Winston-Salem, N. C.—The Water Committee has been authorized to purchase a 2,000,000-gal. pump, and construct a clear-water basin at the Salem pumping station. Estimated cost, $12,000.

Columbia, S. C.—The city voted, June 3, to annex three suburbs, and will proceed immediately to extend the water and sewer systems to those localities. Estimated cost, $100,000. W. H. Gibbes is Mayor. Noted May 29.

Mount Pleasant, S. C.—It is proposed to install a water system here, estimated to cost $20,000. Tentative plans provide for a 100,000-gal. standpipe and an artesian well, with the necessary pipe lines and hydrants.

Alachua, Fla.—The J. B. McCrary Co., Third National Bank Bldg., Atlanta, Ga., has prepared plans for a water system and electric-light plant here. Estimated cost, $24,000.

Thomasville, Ala.—Edgar B. Kay, Consult. Engr., Tuscaloosa, Ala., has prepared plans and specifications for the installation of water and sewer systems here. An election has been called for July 21 to vote on a bond issue of $25,000.

Paducah, Ky.—L. A. Washington, City Engr., has submitted to the City Council plans for the establishment of a new pumping station, the equipment for which will cost $9000. The pumps will be electrically operated. Noted May 29.

Winchester, Ky.—The Winchester Water Co. contemplates the installation of additional pumps for pumping the water from the Kentucky River to the town.

†Akron, Ohio—(Official)—The following bids were received by the Water Committee, June 5, for its construction of 2240 cu.ft. of 51-in. steel pipe from the reservoir to the pumping station: East Jersey Pipe Co., for lock-bar pipe, $101,100; Carroll-Porter Co., Pittsburgh, Penn., lock bar, $95,054, riveted, $97,290; for 30- and 48-in. concrete drain work in connection with the water system the following bids were received: Payne-Gillen Co., Akron, $55,250; Amata Construction Co., Cleveland, Ohio, $52,205; W. H. Tunt, Akron, $34,336; All bids were rejected as being excessive and the work will be readvertised later in the season. Frank A. Barbour, Tremont Bldg., Boston, is Consult. Engr. Noted May 29 and June 12.

†Akron, Ohio—According to press reports, a contract to furnish and install a 10,000,000-gal. reciprocating pump in the city pumping station, has been awarded to the WILLIAM TOD CO., Youngstown, Ohio, at $78,000. Noted May 15.

Cincinnati, Ohio—(Official)—Bids will be received by V. T. Price, Dir. Pub. Ser., until noon, July 1, for laying c.-i. water pipe, special castings and valves in Madison Road. Plans and specifications may be obtained at the office of the General Superintendent of the Water-Works Department.

Cortland, Ohio—An election has been called for July 19, to vote on a bond issue of $20,700, for constructing a water system. L. Hutton is Mayor.

Glouster, Ohio—(Official)—Bids will be received by the Board of Public Affairs until noon, June 28, for constructing a receiving basin for the municipal water system. J. L. Davis is Clk.

Lima, Ohio—(Official)—Bids will be received by J. R. Morris, Dir. Pub. Ser., until July 3, for laying 14,830 ft. of 20-in. bell and spigot c.-i. water main. The pipe will be furnished by the city. G. A. Crayton is City Engr. Noted June 19.

New Lexington, Ohio—At an election held June 16, bonds for $50,000 were voted for purchasing the water system of the Lexington Water Co. Noted May 1.

†Pleasant City, Ohio—(Official)—The contract to construct a water system here has been awarded to F. R. STONE, Lima, Ohio, at $14,350. Bids were opened by M. F. Devine, Village Clk., June 13. H. L. Maddock, Newark, Ohio, is Consult. Engr. Noted June 5.

Rocky River, Ohio—(Official)—Bids will be received by Frank Mitchell, Village Clk., until noon, July 22, for installing a water system.

Youngstown, Ohio—Bids will be received by the Director of Public Service until July 1, for furnishing and laying a 30- and 36-in. water main across the Mahoning River. W. H. McMillin is Clk.

Zanesville, Ohio—Bids will be received by A. J. Voll, Clk., Bd. Pub. Ser., until July 2, for furnishing 1000 ft. of 20-in. c.-i. water pipe, specials and water gates.

West Terre Haute, Ind.—(Official)—No bids were received, June 16, for constructing the proposed water system. The contract will probably be readvertised. W. R. Paige, Rose Dispensary Bldg., Terre Haute, is Consult. Engr. Noted June 5.

Bay City, Mich.—E. L. Dunbar, Supt. W.-Wks., is receiving bids for a 5,000,000-gal. high-duty pump, to be installed at the West Side pumping station.

†Niles, Mich.—Official)—The contract to lay water mains in various streets here has been awarded to E. H. POWER, Niles, at 75c. per ft. Bids were opened June 18. Noted June 12.

Altamont, Ill.—Bids will be received by the City Clerk until 7:30 p.m., June 27, for constructing a 40,000-gal. steel tank on a 100-ft. steel tower and about 2500 ft. of 4- and 8-in. c.-i. pipe, with the necessary castings, hydrants, valves and boxes. Plans were prepared by the Fuller-Coult Co., Chemical Bldg., St. Louis, Mo. F. Schumacher is Mayor. Noted Apr. 3.

†Cambridge, Ill.—The contract to construct an artesian well and pumping plant here has been awarded to the J. P. MILLER WELL CO., Chicago, at $2.95 per ft. for the well. Bids were opened May 29.

Atlantic, Iowa—According to press reports, bids will be received by T. E. Nichols, City Clk., until June 30, for drilling, casing and connecting six 6-in. wells.

Deerwood, Minn.—(Official)—Bids will be received by J. O. Hage, Village Clk., until 11 a.m., June 28, for constructing a complete water system, according to plans prepared by the Oscar Claussen Engineering Co., St. Paul, Minn. Noted June 19.

Lake City, Minn.—(Official)—Bids will be received by the City Council until 8 p.m., July 1, for extending the water distributing system, and constructing a 500,000-gal. reinforced concrete reservoir. The contract involves furnishing and laying about 12,000 ft. of 4-, 6- and 12-in. c.-i. or wood stave pipe, with 5 tons of specials. Plans and specifications are on file at the office of L. P. Wolff, Consult. Engr., Germania Life Bldg., St. Paul, Minn.

†Norfolk, Neb.—(Official)—The contract to extend the water system here has been awarded to the GENUNG HEATING & CONSTRUCTION CO., Norfolk, at $9100. Bids were opened June 16, by P. F. Stafford, City Clk. Noted June 5.

Omaha, Neb.—R. B. Howell, Water Comr., contemplates the installation of new boilers, a smokestack and coal storage basin. Estimated cost, $80,000.

†Ralston, Neb.—The contract to lay the mains for the proposed new water system here has been awarded to the ALAMO SUPPLY CO., Omaha, Neb., at $19,493. Noted May 15.

Mayville, N. D.—(Official)—Bids will be received by C. C. Vangen, City Audr., until 10 a.m., July 15, for equipping an electric-light plant and constructing an addition to the water system. Plans and specifications are on file with the Oscar Claussen Engineering Co., St. Paul, Minn. Bids on this contract were received and rejected June 18. Noted June 5.

New Rockford, N. D.—F. S. Crabbe, Consult. Engr., Fargo, N. D., has been retained by the City Council to prepare plans for the installation of a water system here.

Choteau, Mont.—According to press reports, Swearingen & McCulloh, Consult. Engrs., Great Falls, Mont., are preparing plans for the installation of a water system here.

Hannibal, Mo.—The City Council has approved the plans of the Hannibal Water Co. for laying 16- and 12-in. water mains in various streets. W. H. Louse is City Clk. Noted June 5.

Hopkins, Mo.—An election will probably soon be called to vote on the installation of a water system. Estimated cost $12,000.

Monroe City, Mo.—(Official)—Bids will be received by George W. Tompkins, City Clk., until 1 p.m., July 8, for constructing a water system estimated to cost $68,000, and a sewer system estimated to cost $10,000. Burns & McDonnell, Scarritt Bldg., Kansas City, Mo., are Consult. Engrs. Noted Apr. 24.

Walnut Ridge, Ark.—R. C. Huston & Co., Memphis, Tenn., have been retained to prepare plans for the proposed water system here. B. F. Graff is Pres., Bd. Town Comrs. Noted May 29.

Coleman, Tex.—M. L. Minter, Engr., has made a survey for a reservoir on Indian Creek. The dam will be 40 ft. high and have a capacity of 336,000,000 gal. Noted June 12.

Houston, Tex.—The City Council has taken preliminary action to call an election to vote on a bond issue of $100,000 for the installation of water mains and fire plugs. This work is contemplated to afford better fire protection.

Port Arthur, Tex.—The Port Arthur Rice & Irrigation Co. is installing additional machinery at its pumping plant near here and making other improvements at a cost of about $40,000. It will add about 8000 acres of land to its irrigated tract.

Bingham, Utah—Bonds for $15,000 were voted recently for installing a water system. Bids for construction will probably soon be asked.

Castle Dale, Utah—According to press reports, it is proposed to install a water system here, estimated to cost $14,000. Bonds have been voted.

Endicott, Wash.—C. H. Green & Co., Consult. Engrs., Paulsen Bldg., Spokane, Wash., are preparing plans for a water system here. Bonds for $12,000 were recently voted for this purpose.

†Hillyard, Wash.—The contract to construct a water system here has been awarded to the JAMES KENNEDY CONSTRUCTION CO., Portland, Ore., at $18,153 for District 1, $10,275 for District 2, and $2545 for District 3.

†Puyallup, Wash.—Contracts were awarded recently, as follows: Furnishing c.-i. pipe, to CRANE & CO., Tacoma, Wash., at $7580; laying pipe, to McKIM, KLINE & ADDISON, Seattle, at $9920.

Seattle, Wash.—(Official)—Bids for constructing a gravity dam at Cedar Lake were received by the Board of Public Works, June 13, as follows: Hans Pederson, $866,578; Nettleton-Bruce-Eschbach Co., $687,110; P. E. McHugh, $976,071; Graff Construction Co., $778,882. A. H. Dimock is City Engr. A list of the item bids on this contract will be published in the Contract Prices columns of this or some other early issue. Noted May 29.

Amity, Ore.—Louis C. Kelsey, Consult. Engr., Selling Bldg., Portland, Ore., has been retained to prepare plans and specifications for the proposed water system here. Estimated cost, $25,000. Noted June 12.

Echo, Ore.—(Official)—June 14, the Teel Irrigation District voted bonds in the amount of $1,200,000 for the construction of necessary works to supply water for irrigation purposes. The District comprises 20,000 acres of land. The main features of construction will be a tunnel 12,341 ft. long; a storage reservoir dam 105 ft. high, 650 ft. long on top and 200 ft. on the bottom; a main canal 19 miles long including five miles of flume, and 54 miles of ditching for distributing system with all structures connected built of concrete. W. B. Hinkle is Engr. in chief, and J. Frank Spinning. Noted June 5, under Salem, Ore.

★Burlingame, Calif.—(Official)—The date of receiving bids for the proposed water system here has been extended from June 13 to July 21. Noted incorrectly June 19.

Dinuba, Calif.—It is proposed to construct an auxiliary pumping plant for the municipal water-works. The plant will cost about $5000.

Lakeview, Calif.—The Nuevo Land Co. will soon award a contract for the construction of a cement pipe and irrigation system at Lakeview to cost $30,000. F. W. Sdalder and J. W. Chase, Riverside, are directors.

Sacramento, Calif.—The City Clerk has been authorized to advertise for bids for furnishing a 450-hp. turbine pumping engine for the Water Department.

Sanger, Calif.—The town contemplates the installation of municipal water and sewer systems.

Santa Barbara, Calif.—The city contemplates voting bonds in the sum of $120,000 for the construction of the Gibraltar Reservoir.

Suisun, Calif.—The Solano Irrigated Farms, Inc., has had plans completed for the erection of a filtration and sterilization plant in Solano County to supply water to Suisun and other towns, the water to be taken from the Sacramento River. The plant will have a capacity of 200,000 gal. per min. Patrick Calhoun, is Pres.

✚**Victoria, B. C.**—(Official)—Bids will be received by C. H. Rust, Water Comr., until noon, July 15, for furnishing and laying about 27½ miles of reinforced concrete pipe and appurtenances on the line of the Sooke Water Supply gravity conduit, according to specifications on file at the Sooke Water Supply Office, 1414 Douglas St., Victoria. Wynn Meredith is Consult. Engr.

Galt, Ont.—The Town Council has been authorized to expend $70,000 for the construction of a water system.

St. Rose, Que.—Bids will be received by J. A. Joly, Secy.-Treas., until July 7, for constructing a water tank, a sewer purification system, a water system, a filtration system and power house, and for furnishing the necessary pumps and other equipment. Plans and specifications are on file at the office of the Secretary-Treasurer, and at the office of Ouimet & Lesage, Consult. Engrs., 76 St. Gabriel St., Montreal.

Winnipeg, Man.—Bids will be received by M. Peterson, Chn. Bd. of Control until July 2, for furnishing and installing two horizontal two-stage turbine pumps, direct coupled to a slow constant speed induction motor, switching gear and starter panel.

SEWERS

✚**Biddeford, Maine**—The contract to construct a trunk sewer here has been awarded to OTTO NELSON CO., 149 Exchange St., Bangor, Maine, at $47,524. The other bids were: Conner Bros., Lowell, Mass., $66,796; F. B. Williams Co., South Attleboro, Mass., $50,818; Joseph Sacco Co., Portsmouth, N. H., $47,823; M. A. Small & Son, Saco, Maine, $49,743; Fallcy & Kelly, Dorchester, Mass., $56,214; F. A. Rumery Co., Portland, $64,118; John Gulliver, Portland, $75,294; C. A. Prest, Topsham, $57,359. Bids were opened June 9. Noted May 29.

★**Portland, Maine**—(Official)—Bids will be received by Bion Bradbury, Comr. Pub. Wks., until noon, July 14, for constructing Section 2 of the East Side intercepting sewer, and Sections 1 and 2 of the Fall Brook branch of the East Side intercepting system. Specifications and proposal blanks may be obtained from the Commissioner. Noted Oct. 17.

✚**Bellows Falls, Vt.**—(Official)—The contract to construct sewers here has been awarded to BALDASARO & ROBINSON, Bellows Falls, at $13,678. Bids were opened by H. C. Bacon, Pres. Bd. of Trustees, June 10. Noted May 29.

Fitchburg, Mass.—(Official)—Bids will be received by the Sewage Disposal Commission until June 30, for furnishing c.-i. pipe, special castings, gate valves and sluice gates for the sewage disposal works. Harrison P. Eddy, of Metcalf & Eddy, 14 Beacon St., Boston, is Consult. Engr. David A. Hartwell is Ch. Engr. Bids will be asked soon for furnishing a small centrifugal pump and air compressor.

Framingham, Mass.—(Official)—Specifications are being prepared for the proposed sewer extensions. Estimated cost, $30,000. F. W. Meserve is Chn. Sewer Com. Noted June 5,

✚✚**Pittsfield, Mass.**—The Board of Public Works received bids June 21, on Newell St. drain construction as follows: C. E. TRUMBULL CO., Boston, Mass., $17,875 (awarded contract); James D. Kelly, Dorchester, Mass., $18,320; F. T. Ley Co., Springfield, Mass., $19,256.

Bids on Pleasure Park drain were: E. P. ROBERTS CO., Pittsfield, Mass., $22,066 (awarded contract); C. E. Trumbull Co., Boston, Mass. $26,625; Y. T. Ley Co., Springfield, Mass., $27,052; H. W. Golden & Son, Troy, N. Y., $31,154. Noted June 12.

★**Bronxville, N. Y.**—(Official)—Bids will be received by the Board of Village Trustees until 8 p.m., July 8, for extending the sewer system, according to plans prepared by George H. Rogers, Village Engr., and now on file at the office of Frank Dinsmore, Village Clk.

Goshen, N. Y.—According to press reports, Clyde Potts, Consult. Engr., New York, has prepared preliminary plans for the installation of a sewer system and sewage disposal plant here. Estimated cost, $50,000 to $80,000.

★**Schenectady, N. Y.**—(Official)—Bids will be received by the Board of Contract and Supply until 2:30 p.m., July 2, for furnishing and supervising the installation of sewage pumping machinery and appurtenances. W. Thomas Wooley is City Engr.

★Bids will be received at the same time for the construction of a sewage pumping station and force main, and for the installation of pumping machinery and appurtenances in North Ferry St. Thomas Wooley is City Engr.

★**Schenectady, N. Y.**—(Official)—Bids will be received by the Board of Contract and Supply until 2:30 p.m., July 9, for constructing a 42-in. intercepting sewer from Nott St. along Front St., to North Ferry St. and a 36-in. sanitary intercepting sewer from the proposed sewage pumping station over private lands and Washington Ave. to near Fuller St. Thomas Wooley is City Engr., and Fred E. Johnson is Secy. Bd. of Contract and Supply. Noted Oct. 31.

Watertown, N. Y.—(Official)—At a special election held June 11, the proposition to construct a sewer in Arlington St. was defeated. E. W. Sayles is City Engr. Noted June 12.

★**Newark, N. J.**—(Official)—Bids will be received by the Passaic Valley Sewerage Commissioners until 2 p.m., July 29, for the following contracts: Section 6, southerly portion, main intercepting sewer in the city of Newark; Section 6, central portion, main intercepting sewer in the city of Newark; Section 6, northly portion, main intercepting sewer in the city of Newark; Section 19, Acquackanonk-Garfield-Passaic Branch intercepting sewer, Borough of Garfield. John S. Gibson is Clk. For particulars, see "Contracts to be Let."

Paterson, N. J.—(Official)—Bids will be received by the Board of Public Works until July 1, for constructing about 5200 ft. of 6- to 24-in. storm water sewer in Main St. H. J. Harder is City Engr.

Plainfield, N. J.—(Official)—Bids for constructing sanitary sewers here were received by the Common Council, June 16, as follows: Mobus Bros., North Plainfield, $9767; Michael Garafano, Summit, N. J., $7283; Alfonso Colucci, Plainfield, $8420; New York Sewage Disposal Co., New York, $11,770; Burke & Bonham, Plainfield, $8476; T. Foster Callahan, Elizabeth, N. J., $8913; C. A. Peterson, Plainfield, $8281. Noted May 29.

✚**Secaucus, N. J.**—According to press reports, the contract to construct a sanitary sewer system for the Clarendon Section has been awarded to CHARLES O'NEILL, Secaucus, at $24,900. Bids were opened June 3. Noted May 22.

Centerville, Penn.—(Official)—R. Winthrop Pratt, Consult. Engr., Hippodrome Bldg., Cleveland, Ohio, has been retained to prepare plans for a sewage treatment plant for Point View, at Mine No. 5 of the Vesta Coal Co., near Centerville. The plant will be of sufficient capacity to serve a population of 5000.

Duquesne, Penn.—(Official)—Bids will be received by the Sewer Committee until noon, July 5, for constructing a sewer in South First St., Third Ward. L. W. Francis is Chn

Philadelphia, Penn.—According to press reports, George S. Webster, Ch. Bureau of Surveys, has prepared plans for a sewage disposal system estimated to cost $25,000,000.

Richmond, Va.—The Administrative Board has forwarded a request to the Common Council asking an appropriation of $27,000 for the construction of the Southside Sewer. Charles E. Bolling is City Engr.

Roanoke, Va.—Bids will be received by W. L. Craft, City Clk., until noon, June 27, for constructing sewers in various streets. F. L. Gibboney is City Engr.

Winton, Va.—At a recent election, bonds for $17,000 were voted for constructing a sewer system.

Charlotte, N. C.—The Executive Board plans to expend $30,000 for the construction of sewers in the suburbs of the city. Bids will probably soon be asked on this work. Joseph Firth is City Engr.

★**Dunn, N. C.**—(Official)—Bids will be received by the Mayor and Board of Commissioners until July 8, for constructing about six miles of 8- to 24-in. pipe sewers. Plans and specifications are on file at the office of M. L. Wade, Mayor, or may be obtained from Gilbert C. White, Consult. Engr., Charlotte, N. C. Noted June 19.

✚**Atlanta, Ga.**—(Official)—Bids for constructing lateral sewers, Groups 6 and 7, were received by the city, June 12, as follows: Group 6: Dysard Construction Co., $15,661; J. R. Cothran, $15,598; B. T. MEEKS, $12,143 (awarded contract); L. R. Brine, $13,943; Cement Stone & Tile Co., $15,954; Group 7: Dysard Construction Co., $17,691; Case & Cothran, $18,092; B. T. MEEKS, $14,064 (awarded contract); L. R. Brine, $16,126; Cement Stone & Tile Co., $18,363. For item bids see under Contract Prices, June 19.

★✚**Birmingham, Ala.**—(Official)—Bids for constructing an extension to the South Side trunk sewer, with laterals, were received by Walter G. Kirkpatrick, City Engr., June 3, as follows: Section 1, SOUTHERN ASPHALT & CONSTRUCTION CO., $70,940 (awarded contract); Sullivan, Long & Haggerty, $73,039; J. W. Gurley & Co., $74,705; Thomas Worthington, $75,825; Dunn & Lallande Bros., $82,596; Section 2, SOUTHERN ASPHALT & CONSTRUCTION CO., $26,945; Sullivan, Long & Haggerty, $31,276; J. W. Gurley & Co., $31,759; Dunn & Lallande Bros., $32,131; Thomas Worthington, $34,027; F. H. Patterson, $37,433; Section 3, SOUTHERN ASPHALT & CONSTRUCTION CO., $70,052 (awarded contract); Thomas Worthington, $77,982; Sullivan, Long & Haggerty, $82,944; J. W. Gurley & Co., $87,188; Dunn & Lallande Bros., $104,052; Section 4, A. C. BROOKS & CO., $27,844 (awarded contract); Southern Asphalt & Construction Co., $28,689; Sullivan, Long & Haggerty, $33,212; J. W. Gurley & Co., $34,533; F. H. Patterson, $41,021; Dunn & Lallande Bros., $44,612.

Thomasville, Ala.—See item under Water Supply—Irrigation.

New Orleans, La.—(Official)—Bids will be received by F. S. Shields, Secy., Sewerage and Water Bd., until noon, July 28, for the following: Contract 53 D, underground conduit from Sewerage Station A to the Mississippi River; Contract 55D, extension to drainage pumping station No. 1, including all foundations, suction and discharge basins; Contract 56D, sluice gates for drainage pumping station No. 1; Contract 57D, traveling crane for drainage pumpnig station No. 1. Noted June 5.

Danville, Ky.—(Official)—The contract to construct sewers in various streets has been awarded to the DILLEHAN BRICK CO., Danville, at $11,625. Bidders were opened by the city, June 14. Noted June 12.

Bexley, Ohio—Bids will be received by George E. Fry, Village Clk., until July 1, for constructing a municipal sewage treatment plant, according to plans prepared by A. Elliott Kimberly, Consult. Engr., 8 East Long St., Columbus. Noted May 1.

Cambridge, Ohio—According to press reports, bids will be received about July 15, for the construction of a sewage disposal plant, according to plans prepared by Karl M. Cosgrove, Consult. Engr., Cambridge, Ohio. J. A. Leyshon is Dir. Pub. Ser.

Cambridge, Ohio—(Official)—Bids will be received by the Directors of Public Service until noon, July 8, for constructing 7500 ft. of 8-in. vitrified sewer, and 6000 ft. of 5-in. house drains. Karl M. Cosgrove is City Engr.

✚**Canton, Ohio**—A contract to construct storm sewers in McDonald, Harrisburg and Oaklawn Aves., has been awarded to LOGAN D. BURD, Canton, at $7600.

Cincinnati, Ohio—General plans have been prepared and submitted to the Director of Public Service, for the Duck Creek Interceptor. Estimated cost, $300,000. This will be the first work on the proposed new sewer system, which is estimated to cost $3,000,000.

Cincinnati Ohio—(Official)—Bids will be received by V. T. Price, Dir. Pub. Ser., until noon, June 27, for constructing main and lateral sewers and drains in various streets.

Cleveland, Ohio—(Official)—R. Winthrop Pratt, Consult. Engr., Hippodrome Bldg., Cleveland, has been retained by the Cincinnati, Painesville & Eastern R.R. Co., Willoughby, Ohio, to prepare plans for a sewage treatment plant at Willoughbeach Park, a result owned by the railroad on the larke near Cleveland.

Euclid, Ohio—(Official)—Bids will be received by Fred H. Shoaff, Village Clk., until noon, July 14, for constructing sewers in various streets, according to plans on file with the Clerk, and at the office of the F. A. Pease Engineering Co., Marshall Bldg., Cleveland.

†Greenfield, Ohio—(Official)—The contract to construct sanitary sewers here has been awarded to the CHILLICOTHE CONSTRUCTION CO., Chillicothe, Ohio, at $4685. Bids were opened June 16, by E. M. Connor, Village Clk. Noted June 5.

Mount Vernon, Ohio—(Official)—R. Winthrop Pratt, Consult. Engr., Hippodrome Bldg., Cleveland, has been retained by the city of Mount Vernon to determine the degree of treatment necessary in connection with the construction of the proposed additional sewerage and an intercepting sewer to carry all of the sewage of the city into the Kokosing River. Noted June 19.

†Niles, Ohio—(Official)—The contract to construct sanitary sewers in Walnut, Pratt and Langley Sts., Pine Alley and East Park Ave. has been awarded to FRANK MANNELLO, Pittsburgh, Penn., at $4964. Bids were opened June 12, by the Board of Control. Noted June 12.

Pemberville, Ohio—The Smith & Boulay Co., The Nasby, Toledo, Ohio, is preparing plans for the construction of a storm water sewer system here.

Youngstown, Ohio—The lowest bids received by the city for constructing the Brier Hill District Sewer were as follows: Section 1, Harris & Kidson, 26,817; Section 2, Charles Harris, $28,483 for brick; Dioro & Serafino, $29,897 for segment block.

Zanesville, Ohio—(Official)—All bids received June 16, for constructing sewers in Wheeling Ave. and other streets were rejected. The contract will be readvertised. A. J. Voll is Clk., Dept. Pub. Ser. Noted June 12.

Marion, Ind.—Bids will be received by the Board of Public Works until June 27, for constructing the West Marion combined storm and sanitary sewer. Estimated cost, $32,000. F. R. Heck is Clk. Noted June 12.

†Flint, Mich.—The contract to construct approximately 33 miles of sewers here has been awarded to ALBERT H. PRANGE, Grand Rapids, Mich., at $374,212. The only other bid received was that of William Moran & Co., Joliet, Ill., at $384,362. Bids were opened by D. E. Newcomb, City Clk., June 3. Noted May 22.

Saline, Mich.—(Official)—Bids for constructing sewers here, according to plans prepared by the W. J. Sherman Co., The Nasby, Toledo, Ohio, were received by the city, June 11, as follows: Emanuel L. Schneider, Ann Arbor, Mich., $19,552; Edwards & Whaley, Milan, Mich., $18,214; VANDERWEEK BROS., Grand Rapids, Mich., $17,517 (awarded contract); Weoge & Tyler, Coldwater, Mich., $18,434.

★Chicago, Ill.—(Official)—Bids will be received by John McGillen, Clk., Sanitary District of Chicago, until noon, June 26, for constructing a sewer outlet at South 52d Ave., and for making alterations and additions, and installing electrical equipment at the R. A. Waller substation. Thomas A. Smyth is Pres. of Bd. For particulars, see under "Contracts to Be Let."

†Evansville, Wis.—The contract to construct about $8000 ft. of storm and sanitary sewers here has been awarded to CHARLES E. HUGHES, Rockford, Ill., at $7889. Bids were opened May 22. Noted May 22.

Horicon, Wis.—According to press reports, plans are being prepared for the construction of six miles of sewers here. Estimated cost, $30,000.

†Jackson, Wis.—(Official)—The contract to construct sewers in various streets here has been awarded to FRED SCHULTZ, Jr., West Bend, Wis., at $5060. Bids were opened June 10. Noted June 5.

Janesville, Wis.—(Official)—Bids will be received by the Board of Public Works until 2 p.m., July 8, for constructing sewers in Sewerage Districts 3, 14 and 15.

†Marinette, Wis.—A contract to extend the main sewer here has been awarded to JOHN STRIFFLER, Streator, Ill., at $25,520.

Marshfield, Wis.—W. G. Kirchoffer, Consult. Engr., Madison Wis., has been retained to prepare plans for improving the sewage disposal plant. Estimated cost, $10,000.

Sheboygan, Wis.—Bids will be received by the Board of Public Works until June 27, for constructing 15-in. pipe sewers in Superior Ave. and other streets.

Davenport, Iowa—The Board of Local Improvements has recommended the construction of sewers and water mains in the third section to Brook's Grove, and in the Glenwood Addition.

Woodbine, Iowa—A special election has been called for July 7 to vote on a bond issue of $20,000 for sewer construction.

Ortonville, Minn.—(Official)—Bids for constructing a sanitary sewer system and sewage disposal plant here were received by C. J. Stark, City Clk., June 16, as follows: Fraser & Danforth, Hackney Bldg., St. Paul, Minn., $11,485; Hagerty Construction Co., $11,980; W. D. Lovell, $13,300; Tanner Bros., $12,020. Noted June 5.

Concordia, Kan.—G. L. McLane, City Engr., has prepared preliminary plans for extending the sewer system to the Arkansas River, and for building a pumping station on the land of the State Reformatory.

†Ralston, Neb.—(Official)—The contract to construct a sewer system here, according to plans prepared by the Towl Engineering Co., Omaha, has been awarded to the OFFERMAN CONSTRUCTION CO., Omaha, at $8000. Bids were opened June 17. Noted June 12.

Mitchell, S. D.—(Official)—Bids will be received by N. H. Jensen, City Audr., until 8 p.m., July 7, for constructing lateral sewers in various streets.

Platte, S. D.—Bids will be received by F. P. Swan, City Audr., until July 7, for laying sewers in portions of Pennsylvania Ave. and other streets.

Helena, Mont.—It is proposed to construct a storm sewer in Beattie St., from Second St., to Broadway and along Broadway to Davis St. Estimated cost, $12,000. William Jordan, Jr., is City Engr.

Carthage, Mo.—The City Engineer has been authorized to prepare plans for a main sewer to serve the south and west sides. Estimated cost, $20,000.

†Brinkley, Ark.—(Official)—The contract to construct about seven miles of 8- to 12-in. pipe sewers and a sewage disposal plant here has been awarded to A. B. DOWELL, Carbondale, Ill., at $23,900. Bids were opened June 19. Noted May 29.

Houston, Tex.—Bids will probably soon be asked for constructing a storm sewer along German and Milby Sts., in the Second Ward. Estimated cost, $150,000. Dan C. Smith, Jr., is City Secy.

Polytechnic, Tex.—Bids will be received by W. H. Brown, City Secy., until June 26, for constructing a sewer system here, according to plans prepared by Nagel & Peterson, Consult. Engrs., Muskogee, Okla. The contract involves the construction of 17,000 ft. of sewers. Noted Jan. 2.

Port Angeles, Wash.—The City Engineer has completed plans for the construction of a trunk sewer in Lincoln St., estimated to cost $61,633. Bids will probably soon be asked on this contract.

Los Angeles, Calif.—McLean & Walsh were low bidders at $13,000, for the construction of a sewer in Nevin Ave., from 32d to Palomares St. Other bidders were: M. N. Pekich and J. S. Ukropina $17,300; M. R. Fulmis, $18,040; Peter Grbovach, $19,995; R. N. Niccevich, $17,300; John Radich, $16,500; J. J. Veselich, $13,750; W. F. Eggert, $16,996; John Sutalo, $13,800; J. C. Wnkcjevich, $21,731; B. M. Sherer, $18,587.

San Francisco, Calif.—The Secretary to the Board of Public Works has been instructed to advertise for bids for laying sewage discharge pipes in Commercial St., from the Embarcadero to Sansome St., and in Fulton St., from 26th to 49th Ave.

St. Rose Que.—See item under Water Supply—Irrigation.

Merriton, Ont.—Plans have been completed for the construction of seven miles of sewers here. Estimated cost, $35,000. Richard Clark is City Clk.

GARBAGE

†Springfield, Mass.—The contract has been awarded to E. T. DAVIS & SON, 157 Lebanon St., Springfield, for the construction of the West Side incinerator, estimated to cost $8000.

San Antonio, Tex.—The city is considering the installation of garbage incinerators to cost about $50,000.

STREETS AND ROADS

Boston, Mass.—Bids will be received until June 30, by the Department of Public Works, for the construction of bituminous macadam roadway in Emmons St., East Boston. L. K. Rourke is Comr.

†The contract for the construction of bitulithic pavement in Centre and South Sts., West Roxbury District, was awarded to WARREN BROS. CO., at $39,699. Other bids were: Boston Paving Co., $41,869; Michael Meehan, $43,106.

Fitchburg, Mass.—The City Council has decided to pave Circle St. at an estimated cost of $8700. F. C. Davis is City Engr.

★Bridgeport, Conn.—(Official)—Bids will be received until 8 p.m., July 8 by the Paving and Sewer Commission, for about 17,300 sq.yd. paving on Park Ave. and John St. Bids will be accepted on any form of permanent pavement. Bernard Keating is Secy.

†Hartford, Conn.—A contract has been awarded by State Highway Commissioner C. J. Bennett to the CHARLES T. EASTBURN CO., Meriden, Conn., for the reconstruction with amiesite of Elm St., Putnam, Conn., a distance of about 1400 lin.ft.

†New Haven, Conn.—The contract for paving Greenwich and Edgewood Aves. with bituminous macadam has been awarded by the Board of Public Works to G. W. BLAKESLEE & SONS, 58 Waverly St., New Haven, at $33,000, and for paving Elm St. with sheet asphalt, to the UNION PAVING CO., Schenectady, N. Y., at $40,000.

★†New Haven, Conn.—(Official)—The contracts for paving the streets in "Group A," about 29,000 sq.yd. of creosoted wood block, and those in "Group B," 43,500 sq.yd., bituminous macadam pavement, were awarded to the HASSAM PAVING CO., New Haven, Conn., and the ROBERT E. DALEY CONSTRUCTION CO., New Haven, respectively. F. L. Ford is City Engr. Noted May 29 and June 12.

†Albany, N. Y.—The Board of Contract and Supply has awarded the contract for the improvement of Whitehall St. to P. W. MULDERRY at $13,073 and a contract for improving a section of Myrtle Ave. to ROBERT DUMARY at $4104.

★Cohoes N. Y.—(Official)—Bids will be received until 8 p.m., July 1, by the Common Council, for approximately 5445 sq.yd. vitrified brick pavement on Ridge Ave. John F. Mahony is City Clk.

Mechanicsville, N. Y.—Bids will be received until 7:30 p.m., July 2, by the Village Council for grading, curbing and paving with vitrified block parts of First and Ciall Aves., Canal, Leonard and Warsaw Sts. The approximate quantities are;

4200 cu.yd. excavation, 11,800 sq.yd. paving and 8750 lin.ft. new curb, old curb reset, etc. Archie W. Smith is Village Clk.

North Tonawanda, N. Y.—The Board of Public Works has directed the City Engineer to prepare plans for repaving Webster St. with brick, at an estimated cost of $16,000. Bids will be asked for at once. A. P. Smith is City Engr.

✚Troy, N. Y.—The Board of Contract and Supply has awarded the contract for paving Fifth Ave., from First to 25th Sts., with bitulithic, to WARREN BROS. PAVING CO. James M. Riley is Secy.

Elizabeth, N. J.—Bids will be received until July 1, by the City Council, for improving Court, South Seventh, East Grand, Christine and Anna Sts. About 15,260 sq.yd. brick pavement, 3270 sq.yd. trap rock pavement and 5680 lin.ft. curb will be required. Wm. P. Neabsey is Street Comr.

★Marlton, N. J.—(Official)—Bids will be received until 3 p.m., July 2, by the Township Committee of Evesham Township for the construction of about 1.74 miles of gravel road, beginning at Maple Ave. and Main St., Marlton, to Moorestown Road, Evesboro. Heister Clymer is Township Clk. George Albert Haines, Medford, N. J., is Engr.

Newark, N. J.—(Official)—Bids will be received until 10 a.m., July 10, by the Committee on Roads of the Board of Chosen Freeholders of Essex County, for paving Bloomfield Ave with granite block between the city line of Newark and the borough line of Glen Ridge, the contract to be let in two sections, Section 1 from Newark to Belleville, Section 2, beginning at Station 6150 and ending at the dividing line between Bloomfield and Glen Ridge. Seymour P. Gilbert is Chn. of Road Com. Frederic A. Reimer is County Engr.

Paterson, N. J.—(Official—Bids will be received until 4 p.m., July 1, by the Board of Public Works, for resurfacing Main St. with about 10,500 sq.yd. of wood or asphalt blocks. H. J. Harder is City Engr.

✚Trenton, N. J.—(Official)—The State House Commission has awarded the contract for 11,000 cu.yd. of grading on the State House grounds to CHARLES A. REID & CO., Trenton, N. J. E. I. Edwards is Controller. Noted June 5.

Westfield, N. J.—(Official)—Bids will be received until 8 p.m., July 7, by the Town Council, for improving East Broad St. from Chestnut St. to Springfield Ave. The approximate quantities are: 16,991 cu.yd. excavation, 11,294 sq.yd. bituminous concrete pavement, 630 sy.yd. macadam pavement, 56 sq.yd. stone block gutter, and 2052 sq.yd. cobble stone gutter. Charles Clark is Town Clk.

Brookville, Penn.—(Official)—Bids will be received until noon, July 2, by the Town Council for grading, curbing and paving portions of West Main, Water, and Pine Sts. and Weinker Way with brick, about 3630 sq.yd. Bids will also be received for relaying the paving on East Main St. Arthur B. Stewart is Clk. of Council.

Coraopolis, Penn.—(Official)—Bids will be received until 7:30 p.m., June 30, by the Borough Council for grading, curbing and paving Fifth Ave., from Chestnut to Montour St., Fleming St. from State to Highland Ave., and Main St. from McIntyre to Highland Ave. Ernest C. Harper is Boro. Secy.

Franklin, Penn.—(Official)—Bids will be received until 7:30 p.m., June 27, by the City Council for repaving Liberty St. from Moffet's Alley to 15th St., and for curbing and paving 12th St. from Elk St. to Otter St. Philip Engelskirger is Controller.

Nottingham, Penn.—(Official)—Bids will be received until 6 p.m., July 15, by the Board of Supervisors of West Nottingham Township, for macadamizing about 1.75 miles of the Christine Road from Nottingham Church and the Village of Glen Roy. John A. Kimble, Nottingham, is Secy.

Pittsburgh, Penn.—(Official)—Bids will be received until 10 a.m., July 11, by the Controller of Allegheny County, for the following road improvements: 2.8 miles of the Wildwood Road in McCandless and Hampton Townships, 1.54 miles of the Curry Hollow Extension Road, Jefferson and Baldwin Townships, 1.05 miles of the Natrona and Brackenridge Road, Harrison Township. John S. Gillespie is Road Comr. R. J. Cunningham is County Controller.

Reading, Penn.—The Mayor has signed ordinances providing for five blocks of brick paving and one of concrete paving on various streets. Bids will soon be asked. Edmond Ulrich is City Engr.

Swissvale, Penn.—(Official)—Bids will be received until 8 p.m., July 3, by the City Council, for grading Milligan Ave. from Westmoreland Ave. to Locust St. E. M. Watt is Supt. Pub. Wks.

Uniontown, Penn.—(Official—Bids will be received until 2 p.m., June 30, by the Road Supervisors of Jefferson Township, Fayette County, for the construction of about two miles of macadam Tarvia covered road in two sections of about 8500 ft. and 1700 ft. respectively. W. H. Binns is Secy.

✚Uniontown, Penn.—(Official)—Bids for the construction of a road in Jefferson Township were received by the County Controller as follows: F. J. FOYE, $31,956 (awarded contract) V. De Giorna, $31,933; McLaughlin Construction Co., $33,813; Donora Construction Co., $34,773; J. G. McGuire, $36,809. Thomas H. Hudson is County Solicitor. Noted May 29.

✚Washington, Penn.—The Commissioners and Controller of Washington County have awarded the Following contracts for road construction: 1.4 miles of the Finleyville-Thomas Road to the COLLINS-GORDON Contracting Co., Pittsburgh, at $18,396; 1.4 miles of the Cecil-Venice Road to OFFUTT KUHN, Greensburg, Penn., at $17,061; one mile of the Hill Church Eighty-Four Road to JOHN L. ELDER, Ebensburg, Penn., at $14,239; 1.2 miles of the Pike Run Road Extension to the DONORA CONSTRUCTION CO., at $23,382; 1.5 miles of the Canonsburg-Thomas Road to JAMES HOLLORAN, Canonsburg, at $19,438; 1.5 miles of the Westland Road to SAMUEL GAMBLE, Carnegie, Penn., at $18,579; one mile of the Claysville-Burnsville Road to REED, LIGGETT & BRITT CO., Washington, Penn., at $18,285; two miles of the Beallsville Fredericktown Road to HASTINGS & PIPER, Charlerol, Penn., at $28,500; 600 ft. of the West Alexander-Burnsville Road to the COLLINS-GORDON CONSTRUCTION CO.; 1 miles of the Donora-Eldora Road to DONORA CONSTRUCTION CO, and one mile of the same road to HASTINGS & PIPER. The contracts for furnishing the brick for paving the above roads were awarded to the MACK MFG. CO. and the PENNSYLVANIA CLAY CO., at prices ranging from $17.50 to $21.50 per M. John H. Moffitt is County Controller. Noted May 29.

Dover, Del.—(Official)—Bids will be received until July by the Levy Court of Kent County for the construction of about 1.45 miles of waterbound macadam road. Caleb Kenney is Rd. Engr.

✚Baltimore, Md.—The State Road Commissioners have awarded a contract to H. K. FAUST, 4106 Belle Ave., Baltimore, at $103,079, for the improvement of Frederick Ave. from Bentalau St. to Vale Ave., and a contract to P. J. FLANIGAN & SONS 120 East Lexington St., Baltimore, at $32,52[illegible] for grading the Reistertown Road from Ruskin Ave. and Pimlico Gate to Druid Hill Park. Wm. L. Marcy is Secy. of the Comn.

A contract has been awarded to the BALTIMORE ASPHALT BLOCK & TILING CO., 231 Courtland St., Baltimore, for street paving Contract No. 120 of Annex Commission, calling for bituminous concrete on Cedar and Carwell Aves., and 36th, 34th and Dulin Sts., at $26,498.

Salisburg, Md.—Bids will be received until July 8 by the Highway Commission, of Wicomico County, at Salisbury, for the construction of section of State-aid highway on the Spring Hill Church Road, between Hebron and Spring Hill Church, a distance of 1.27 miles; plans and specifications on file at the office of State Roads Commission, 534 N. Howard St., Baltimore, Md., and at the office of the County Commissioners, at Salisbury.

Towson, Md.—Bids will be received until July 10 by the Highway Commissioners of Baltimore County, for the construction of 1.39 miles of the Warren Road and 0.76 mile of the Charles St. Ave. Road, between Chesapeake Ave. and Joppa Road. E. Stanton Bosley is Secy.

Marion, Va.—(Official)—Bids will be received until July 7 by the Board of Supervisors of Smyth County for the construction of about 20 miles of macadam road in Marion District, divided into four sections, and for 27 miles macadam road and 30 miles grading in St. Clair District. Plans and specifications are on file at the Clerk's office, Marion, and with P. St. John Wilson, State Highway Comr., Richmond.

Vinton, Va.—A bond issue of $8000 has been voted by the town for the improvement of streets and sidewalks.

New Cumberland, W. Va.—(Official—Bids will be received until noon, July 5, by the County Court of Hancock County, for paving 2.6 miles of the County Road from the Brooke County line at Hollidays Cove to Ave. A, Weirton. James A. Bowers, Weirton, W. Va., is Engr.

Graham, N. C.—The town has voted to issue $50,000 of bonds for paving streets and constructing sidewalks.

St. Augustine, Fla.—The Commissioners of St. Johns County have been authorized by the Governor to issue $70,000 to be used for the construction of permanent roads. Tentative plans have been prepared for paving three miles of John Anderson Blvd., and to hard surface several other roads; also to complete the road from St. Augustine to Hastings by way of Elkton.

Titusville, Fla.—(Official)—Bids will be received until 2 p.m., July 7, by the Board of Commissioners of Brevard County for improving about 3.25 miles of the Indian River and Orlando Highway from Mims to Six Mile Branch. J. F. Mitchell is Clk. L. R. Paxton is County Engr.

✚Selma, Ala.—(Official)—The City Council has awarded the contract for paving Dallas Ave. to the MONTGOMERY COURT CO., at $25,311. Bids were received on June 12. W. S. Knapp is Asst. City Engr.

Clarksdale, Miss.—(Official)—Bids will be received until July 8, by the Mayor and City Commissioners for asphaltic concrete paving on portions of Second and Third Sts., Issaquena, Yazoo and Delta Aves. About 26,000 sq.yd. will be required. W. S. Bobo is City Engr. M. W. Purnell is City Clk.

✚New Orleans, La.—(Official)—The contract for improving Fern St., from Commercial to Mobile Sts., was awarded by the City Council to the BARBER ASPHALT PAVING CO., at $41,643, of which $33,288 was for paving only. Thomas L. Willis is Asst. City Engr.

Newport, Ky.—Bids will be received until noon, July 7, by the City Commissioners for paving York St., from Eighth to Ninth St., with creosoted wood block or granite block.

Winchester, Ky.—Bids will be received until 8 p.m., July 4, by the City Council, for the construction of about 15,000 sq.yd. brick pavement. S. B. Tracy is City Clk.

Cambridge, Ohio.—(Official)—Bids will be received by the Director of Public Service until noon, July 10, for constructing 11,000 sq.yd. of vitrified block pavement. Karl M. Cosgrove is City Engr.

Cleveland Heights, Ohio—(Official)—Bids will be received until noon, July 8, by the Village Council, for grading Yellowstone Rd. from Mayfield to Noble Rd. H. H. Canfield is Village Clk.

Columbus, Ohio—(Official)—Bids will be received until 2 p.m., July 3 by the State Highway Commissioner for grading and paving with waterbound macadam, bituminous surface, 1.86 miles of the Newark-New Lexington Road at an estimated cost of $18,726; for grading and paving with waterbound macadam, 2.4 miles of the Canton-Steubenville Road at an estimated cost of $31,096. James R .Marker is Comr.

Bids will be received until 2 p.m., July 3 for grading and paving with concrete, 1.10 miles of the Scotland Station Easterly Road at an estimated cost of $15,453; for grading and paving with concrete 2.64 miles of the Akron-Youngstown Road at an estimated cost of $34,991.

✚The Board of Control has awarded contracts for street improvements as follows: Sullivan Ave., from Central to Hague Ave., (asphalt) ANDREWS PAVING CO., $113,875;

Long St. from Winner to Woodland Ave., (asphalt) A. G. PUGH, $20,176; Monroe Ave. from Broad to Oak St., $3156; Monroe Ave. from Oak St. to Bryden Rd., $6092 and Parkwood Ave. from Clifton to Mt. Vernon Ave., $8721. The following contracts were awarded for brick paving; East Ave. from Oakley to Maynard Ave., M. T. HALEY, $5638; 11th St. from the first alley north of Broad to Long St., S. T. KNIGHT, $5098, Factory St., from Buttles to First Ave., B. F. PATTERSON, $6989; Lechner Ave. from Neil to Harrison Ave., B. F. PATTERSON, $5839; Oakley Ave. from Palmetto to Sullivan, FOLEY BROS., $19,797; Schiller St. from High to Parsons, $25,967; Sheldon Ave. from Parsons to Kine, S. T. KNIGHT, $15,479, Second Ave. from High to Sixth St., B. F. PATTERSON, $15,158; Sixth St. from Fifth to 11th Ave., S. T. KNIGHT, $17,230, Welch Ave., Parsons to Anne St., W. H. GRAHAM, $5303, Markison Ave., High St. to Parsons Ave., ANDREWS PAVING Co., $29,764; Lechner Ave. from Doren to Sullivant Ave. FOLEY BROS., $10,814.

Dayton, Ohio—Bids will be received until July 2 by the Director of Public Service for paving various streets and alleys, also for resurfacing various streets and replacing curb, gutter and concrete sidewalks. R. P. Sebold is Dir. Chas. J. Gross is Secy.

Euclid, Ohio—(Official—Bids will be received until noon, July 14, by the Village Council for grading, draining and paving with brick parts of Lampson Drive, Cromwell, Colonial, Quenton and Mannering Roads. Fred H. Schoaff is Village Clk.

Greenwich, Ohio—Bids will be received until noon, July 14, by the Village Council, for about 5700 sq.yd. brick or bituminous macadam pavement on various streets. F. H. Daniels is Village Clk.

Junction City, Ohio—Bids will be received until June 28, by the Village Clerk for improving portions of Main and Logan Sts.

+Lowellville, Ohio—(Official)—The Trustees of Poland Township have awarded the contract for paving a portion of Section 1 of the Poland-Struthers Road with brick to CHAS. HARRIS, Youngstown, Ohio, at $9000. W. J. Maurice, Lowellville, is Township Clk. Noted June 12.

Rocky River, Ohio—(Official)—Bids will be received until noon, July 22, by the Village Council, for the construction of concrete sidewalks on North Ridge Road. Frank Mitchell is Village Clk.

+Wyoming, Ohio—(Official)—The Village Council has awarded the contract for improving various streets to the ANDREWS ASPHALT PAVING CO., Hamilton, Ohio, at 46c. per lin.ft. Other bidders were: Elliott Bros., 48c., Wm. Barber, 54c., and J. McJoint, 51c. George Eversman is Clk. Noted May 22.

Indiana—(Official)—Bids will be received for road improvements in Indiana as follows:

July 1, at Fort Wayne, by the Commissioners of Allen County for the construction of two roads. Calvin H. Brown is Audr.

July 3, at Bluffton, by the Commissioners of Wells County for the construction of five stone roads. L. A. Williamson is Audr. July 7, at Franklin, by the Commissioners of Johnson County, for the construction of a road in Hensley and Union Township. H. L. Knox is Audr.

July 7, at Kentland, by the Commissioners of Newton County for the construction of roads in Iroquois and Jefferson Townships. S. R. Sizelove is Audr.

July 7, at Shoals, by the Commissioners of Martin County for building a road in Perry Township. Lorenzo D. Haga is Audr.

July 7, at Vernon, by the Commissioners of Jennings County for the construction of roads in Geneva and Lovett Townships. G. H. Bernhardt is Audr.

July 7, at Rushville, by the Commissioners of Rush County for improving the Louden Road, Walker Township. Allen R. Holden is Audr.

July 7, at Scottsburg, by the Commissioners of Scott County for the construction of roads in Lexington, Johnson, Jennings and Vienna Townships. Robert Blunt is Audr.

July 7, at Greenfield, by the Commissioners of Hancock County for the construction of a road in Sugar Creek Township. Lawrence Wood is Audr.

July 7, at Fowler, by the Commissioners of Benton County for the construction of a crushed limestone road in Center Township. Warren Mankey is Audr.

July 7, at English, by the Commissioners of Crawford County for the construction of a road in Union township. Jos. B. Enlow is Audr.

July 7, at Mount Vernon, by the Commissioners of Posey County for the construction of three gravel roads. Jos R. Haines is Audr.

July 7, at Rensselaer, by the Commissioners of Jasper County for the construction of roads in Gillam and Kankakee Townships. J. P. Hammond is Audr.

July 8, at Rockville, by the Commissioners of Parke County for the construction of seven gravel roads. James E. Elder is Audr.

July 8, at Marion, by the Commissioners of Grant County for the construction of five roads in Center Township and one in Washington Township. E. H. Kimball is Audr.

July 8, at Logansport, by the Commissioners of Cass County for the construction of a road in Eel Township. J. E. Wallace is Audr.

July 8, at Corydon, by the Commissioners of Wabash County for the construction of a road in Pleasant Township. D. Showalter is Audr.

July 8, at Martinsville, by the Commissioners of Morgan County for the construction of a brick road in Washington Township. J. S. Whitaker is Audr.

July 8, at Plymouth, by the Commissioners of Marshall County for the construction of roads in Bourbon Township. C. F. McCoy is Audr.

July 8, at Princeton, by the Commissioners of Gibson County for the construction of roads in Barton and Montgomery Townships. William T. Roberts is Audr.

July 8, at Kokomo, by the Commissioners of Howard County for the construction of gravel roads in Ervin, Taylor and Honey Creek Townships. E. B. Swift is Audr.

July 8, at Rockville, by the Commissioners of Pike County for the construction of five highways. John D. Gray is Audr.

July 8, at Valparaiso, by the Commissioners of Porter County for the construction of a road in Washington Township. C. A. Blachly is Audr.

July 9, at Crown Point, by the Commissioners of Lake County for constructing six gravel roads. Chas. A. Johnson is Audr.

July 9, at Bloomington, by the Commissioners of Monroe County for the construction of roads in Richland and Van Buren Townships. W. F. Kinser is Audr.

July 9, at Columbus, by the Commissioners of Bartholemew County for the construction of roads in Columbus, Hancock and Clifty Townships. Philip Sater is Audr.

July 10, at Crown Point, by the Commissioners of Lake County for the construction of two roads in Calumet Township. Chas. A. Johnson is Audr.

July 11, at Corydon, by the Commissioners or Harrison County for the construction of a road in Heth township. J. L. O'Bannon is Audr.

Bremen, Ind.—(Official)—Bids will be received until 6 p.m., June 26, by the Board of Town Trustees for paving portions of Center and Plymouth Sts. with brick, asphalt, concrete bitumen, or bitulithic pavement. The approximate quantity required is 14,206 sq.yd. T. Frank Knoblock is Town Clk.

+Corydon, Ind.—(Official)—The Commissioners of Harrison County have awarded a contract to QUEBBLEMAN & PILLARS at $4449 for the construction of a road in Harrison Township. There were no other bids. J. L. O'Bannon is Audr. Noted May 29.

Indianapolis, Ind.—The Republic Construction Co. was low bidder at $2.75 per sq.yd., for 6980 sq.yd. creosoted wood block pavement on 32d St. Chas. A. Schrader is Pres. Bd. of Pub. Wks.

+Detroit, Mich.—The Department of Public Works has awarded contracts for 16,231 sq.yd. paving on five streets to J. A. MERCER at $41,592. J. J. Haarer is Comr.

East St. Louis, Ill.—The Board of Local Improvements has decided to repave Broadway, Collinsville and Missouri Aves., and Front St., and has instructed the City Engineer to prepare plans. The approximate cost will be $100,000. E. F. Harper is City Engr.

Elgin, Ill.—(Official)—Bids will be received until 10 a.m., June 30, by the Board of Local Improvements for paving parts of Milwaukee St. and Riverside Ave. with brick, about 5493 sq.yd. Albert Fehrman is Pres. William F. Syila is City Clk.

Freeport, Ill.—The City Council has passed ordinances for about 125,000 sq.yd. pavement on various streets to be completed this summer and bids will soon be asked. The approximate cost is $250,000. Chas. Hepner is City Engr.

Peoria, Ill.—The Board of Local Improvements has ordered the advertisement of bids for paving Cedar St. from Warner Ave. to Brotherson St. The City Engineer has been instructed to prepare plans and estimates for paving Richmond Ave. from Knoxville Ave. to North St. L. C. Jeffries is City Engr.

Madison, Wis.—The Board of Public Works contemplates paving East Main St. and West Washington Ave. with asphalt. E. E. Parker is City Engr.

+Milwaukee, Wis.—The Department of Public Works has awarded the contract for paving Reed St. from Washington St. to National Ave. with granite block to JOHN WEIHER at $15,170, and for macadamizing Auer Ave. to J. H. DONAHUE at $8005. F. G. Simmons is Comr.

Bloomfield, Iowa—Bids will be received until July 24, by the City Council for about 5000 sq.yd. paving and 3500 lin. ft. curb. Bids will be accepted for brick, concrete or asphaltic concrete pavement. A. B. Welch is City Clk.

Eagle Grove, Iowa—(Official)—Bids will be received until 7:30 p.m., June 30, by the City Clerk for the construction of about 32,168 sq.yd. of brick block, portland cement concrete, asphaltic concrete or bitulithic pavement, and 2722 lin. ft. combined curb and gutter. C. H. Currie, Webster City, Iowa, is Engr.-in-Charge.

Hamburg, Iowa—It is reported that bids will be received about July 15 by the City Council for about 38,000 sq.yd. pavement, various standard materials and 12,000 lin.ft. curb and gutter. H. Grevenkamp is City Engr.

Shenandoah, Iowa—The City Council has passed ordinances authorizing the construction of 15 blocks of asphalt pavement, and bids will soon be asked.

Butte, Mont.—Bids will be received until July 1 by the City Council, for about 5000 sq.yd. bitulithic paving. W. A. Willis is City Clk. Paul A. Gow is City Engr.

Kansas City, Mo.—Bids will be received until June 30 by the Commissioners of Jackson County for grading and draining about 4.66 miles of the Stayton Road.

Conway, Ark.—(Official)—Bids will be received until 3 p.m., July 2, by Street Improvement District No. 1 for the construction of approximately 12,000 sq.yd. of paving, 3500 lin.ft. curb and gutter and 700 ft. of storm sewer. G. H. Burr is Engr. W. M. Harrell is Secy. Noted May 22.

+Belton, Tex.—The Board of Commissioners of Bell County has awarded the contract for the construction of roads in Precinct No. 1 to the WITT, FOUNTAIN SHAW ENGINEERING CO., Dallas, Tex., at approximately $150,000. There were 13 other bidders.

+Greenville, Tex.—The City Council has awarded the contract for paving various streets with asphaltic concrete to LEVY & LEVY, Muskogee, Okla. A. L. Donaldson is City Engr.

Denver, Colo.—The State Highway Commissioner has announced that $1,000,000 will be spent for the construction of state roads during 1913, and it is estimated that the various counties will spend $1,250,000 additional on county highways.

✝Phoenix, Ariz.—The Commissioners of Special Road District No. 1 have awarded the contract for the construction of the Central Ave. Blvd. to the ARIZONA ASPHALT PAVING CO. at $32,000. Bitulithic on a concrete base will be used. E. M. Lamson is Clk. Noted May 8 and May 22.

✝Monroe, Wash.—The City Council has awarded a contract for 3961 lin.ft. of paving to H. C. MALOTT, 6526 17th St., N. E., Seattle, at $19,300. G. F. Cook is City Clk. Noted May 29.

✝Renton, Wash.—(Official)—The contract for the improvement of Cedar St. was awarded by the City Council to GEORGE A. BANDERETT, Renton, at $5873. C. R. Campbell bill $5945. Grant Bates is City Clk. Noted May 29.

✝Spokane, Wash.—The City Council has awarded the contract for paving Mission Ave. to MITCHELL BROS., Exchange Bank Bldg., Spokane, at $39,764, using Spokane Bituminous No. 2. Noted June 19.

The City Engineer has completed plans for paving 13th Ave. from Ferris Court to Grand Blvd., about 29,000 sq.yd. Bids will soon be asked. D. C. Coates is Comr. of Pub. Wks.

Glendale, Calif.—The City Trustees plan to pave Broadway from Glendale to Central Ave., a distance of almost one mile. Asphalt will be used, with concrete curb and gutter.

✝Inglewood, Calif.—The contract for the construction of macadam pavement, concrete curb, gutters and sidewalks on Spruce St. was awarded to S. G. CUMMINGS, 1302 North 22nd St., at $13,955.

Los Angeles, Calif.—The City Trustees have awarded the contract for the improvement of Chesterfield Sq., bounded by Slauson and Western Aves., Arlington and 51st Sts., to FORD & STOUT, at approximately $87,000. The work includes 700,000 sq.ft. asphalt paving on concrete base.

Pomona, Calif.—A special election will shortly be held to vote on an issue of $75,000 of bonds, the proceeds to be used for street improvements. C. E. Bayley is City Engr.

✝San Diego, Calif.—The City Trustees have awarded the contract for grading Robinson Ave. from Tenth to Florida St. to the C. L. HYDE CONSTRUCTION CO., at $10,061. Wm. M. Rumsey is City Engr.

San Francisco, Calif.—The Board of Public Works has requested the Board of Supervisors to appropriate $40,419 for paving Bay St. from the Embarcadero to Leavenworth St. The Board of Public Works is also planning to pave First St. from Market to Mission St., with vitrified brick. M. M. O'Shaugnessy is City Engr. k.

San Rafael, Calif.—This city contemplates spending $100,000 for street improvements, $25,000 for a street repairing plant, $25,000 for an incinerator, and $40,000 for dredging the San Rafael Canal.

✝Venice, Calif.—THE METROPOLITAN CONTRACTING CO., 155 Wilson Building, Los Angeles, was awarded the contract at $10,132, for improving Washington Blvd.

Ventura, Calif.—Bids will be received until July 9 by the Board of Supervisors of Ventura County for paving the Montalvo Bridge with 3½-in. asphalt macadam. The bridge is 1824 ft. long and 19½ ft. wide. J. B. McClosky is County Clk.

Montreal, Que.—The Board of Control has recommended that the City Council pass an ordinance for paving and otherwise improving the Champ de Mars at an estimated cost of $35,400.

✝Berlin, Ont.—(Official)—The City Council has awarded the contract for various street improvements to the WARREN BITUMINOUS PAVING CO., 103 Bay St., Toronto, Ont., at $51,628. H. Johnston is City Engr. A. H. Millar is Clk. Noted June 5.

Merriton, Ont.—(Official)—Bids will be received until July 10 by the Town Clerk for constructing concrete sidewalks on various streets at an estimated cost of $20,000. R. Clark is Town Clk. F. N. Rutherford is Engr. Noted June 19.

Ottawa, Ont.—The City Council plans street improvements in the near future at an estimated cost of $15,000. F. C. Askwith is City Engr.

✝Calgary, Alta.—The City Council has awarded the contract for 50,000 sq.yd. asphaltic concrete paving to the CROWN PAVING & CONSTRUCTION CO., at prices ranging from $2.45 to $2.75 per sq.yd., and 65c. per ft. for curb and gutter.

Red Deer, Alta.—The taxpayers have passed bylaws authorizing the expenditure of $10,000 for sidewalk construction and $8000 for other street improvements.

FEDERAL GOVERNMENT WORK

Mechanical Equipment—Bangor, Maine— Bids will be received by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., until 3 p.m., July 31, for the mechanical equipment, except lighting fixtures, elevator and lift, at the U. S. post office at Bangor.

Dredging—Boston, Mass.—(Official)—Bids were received, June 14, by Col. Frederic V. Abbot, Corps Engrs., U. S. A. Boston for dredging in the Merrimac River: (a) below Rocks Bridge: (b) above Rocks Bridge and at Curriers Shoal: Bay State Dredging Co., Boston, (a) 1.95 per cu.yd.; (b) 86c.; Commonwealth Dredging Co., Boston, (a) 2.20; (b) 74c.

Building—Hingham, Mass.—Bids will be received until 11 a.m., July 12, by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for the construction of a magazine for smokeless powder at the naval magazine at Hingham. The sum of $16,000 is available for the work.

Heating Plant—Newport, R. I.—Bids will be received until 11 a.m., July 12, by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for the erection of a building for the heating plant at the Naval Hospital Reservation, Newport.

★Dredging—New Haven, Conn.—(Official)—Bids will be received until 2 p.m., July 25, by Maj. G. B. Pillsbury, Corps Engrs., U. S. A., New London, Conn., for dredging in New Haven Harbor.

Dredging—New London, Conn.—Bids will be received by Maj. G. B. Pillsbury, Corps Engrs., U. S. A., New London, Conn., until July 5, for dredging in Housatonic River, Conn.

★Dredging—New York. N. Y.—(Official)—Bids will be received by Col. Frederic V. Abbott, Corps Engrs., U. S. A., Army Bldg., New York, until noon, July 19, for dredging in the Raritan River, N. J.

Dredging—Philadelphia, Penn.—Bids will be received until 11 a.m., July 12, by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for dredging at the Philadelphia Navy Yard.

★Dredging—Wilmington, Del.—(Official)—Bids will be received until 11 a.m., July 27, by May R. R. Raymond, Corps Engrs., U. S. A., Wilmington, for dredging the harbor at Wilmington.

Seawall—Annapolis, Md.—(Official)—Bids were received as follows, June 21, by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for the construction of a reinforced-concrete seawall at the Naval Experiment Station, Annapolis: Item (1), work complete, using cylindrical shells, type (A), (B) or (C); Item (2), net price for omission of each bay of 6 ft., using cylindrical shells, type (A), (B) or (C); Item (3), net price per pile in place for another piles if present piles cannot be used; Item (4), amount to be deducted under Item (1), if each shell in 234 ft. of the south wall is made 8 ft. long instead of 6 ft., types (A), (B) or (C). Twohig & Easterly, Norfolk, Va., (1A), $56,571; (1B), $51,547; (1C) $51,460; (2A) $370; (2BC) $330; (3) $64; (4A) $1840; (4BC) $1532. Interstate Construction Co., 1170 Broadway, New York, (1A) $58,500; (1BC) $54,800; (2A) $440; (2BC) $410; (3) $16; (4A) $2480; (4BC) $1320. Riverside Contracting Co., 39 Cortlandt St., New York, (1ABC) $66,600; (ABC) $480; (3) $25; (4ABC) $1200. Sanford & Brooks, 24 Commerce St., Baltimore, Md., (1A) $41,700; (1BC) $48,200; (2A) $300; (2BC) $350; (3) $15; (4A) $1700; (4BC) $2300. Amount available, $50,000.

★Repairs to Mechanical Equipment—Washington, D. C.—(Official)— Bids will be received until 3 p.m., July 21, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, for repairs to the mechanical equipment of the U. S. Treasury and the Butler Building, Washington.

Shell—Washington, D. C.—The following bids were received June 13 by the Chief of Ordance, Washington, for furnishing projectiles: Item (1) 100 14-in. A. P. shell, Model 1909; (2) 600 12-in. D. P. shell, Model 1908, weight 1046 lb.; (3) 700 12-in. D. P. mortar shell, Model 1911. Washington Steel & Ordnance Co., Washington, D. C., (1) $524 each; (2) $320 each; (3) $230 each. American & British Mfg. Co., Bridgeport, Conn.; (2) for 200 only, $335 each; (3) for 300 only, $221 each. Midvale Steel Co., Philadelphia, Penn., (1) $620 each; (2) $408 each; (3) $298 each. Watertown Arsenal, Watertown, Mass., (2) $250 each; (3) $175 each. Bethlehem Steel Co., South Bethlehem, Penn., (1) for 100, $565 each; (2) $312 each; (3) $246 each.

✝Coal Barges—Washington, D. C.—The U. S. Government has awarded the contract for the construction of 10 coal barges to WILLIAM CRAMP & SONS SHIP & ENGINE BLDG. CO., Beach and Ball Sts., Philadelphia, Penn., at $185,000.

★Ash Conveyor—Washington, D. C.—(Official)—Bids will be received until 2 p.m., June 30, by the Department of the Interior, Washington, for the furnishing all labor and material required in the erection and completion of an ash conveyor for the central heating plant, Freedman's Hospital, Washington, in acordance with drawings and specifications for the work, copies of which may be obtained on application to the Chief Clerk of the Department. Award will be made of contract subject to appropriation by Congress to meet the expense of the work.

✝Forgings—Washington, D. C.—The contracts for furnishing six sets of 12-in. 50-calibre steel gun forgings for the Navy Ordnance Department, bids opened June 4, has been awarded to the MIDVALE STEEL CO., Philadelphia, Penn., at 34.5c. per lb. for four sets; and to the BETHLEHEM STEEL CO., South Bethlehem, Penn., 34.5c. per lb. for two sets.

★Lock and Dam—Wheeling, W. Va.—(Official)—Bids will be received until 11 a.m., July 23, by Maj. F. W. Altstaetter, Corps Engrs., U. S. A., Wheeling, for the construction of Lock and Dam No. 16, Ohio River.

Boiler, Etc.—Asheville, N. C.—(Official)—Bids will be received until noon, June 27, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D .C., for a new heating boiler, breeching, stack, etc., in the post office and court house, Asheville, N. C., in accordance with the specifications copies of which may be obtained at this office, at the discretion of the Supervising Architect.

Buildings—Cherokee, N. C.—Bids will be received until 2 p.m., July 11, by the Commissioner of Indian Affairs, Dept. of the Interior, Washington, D. C., for the construction of frame quarters and a brick laundry at the Cherokee Indian School, Cherokee.

Concrete Wharves—Charleston, S. C.—Bids will be received by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., until 11 a.m., July 31, for constructing concrete wharves at the Charleston Navy Yard. Estimated cost, $290,000.

★Dredging—Jacksonville, Fla.—(Official) — Bids will be received until noon, July 21, by Maj. J. R. Slattery, Corps Engrs., U. S. A., Jacksonville, for dredging and rock removal at Trout Creek Cut in St. Johns River, Fla.

★Dredging—Mobiled, Ala. — (Official)—Bids will be received until 11 a.m., July 25, by Lieut.-Col. C. A. F. Flager, Corps Engrs., U. S. A., Mobile, for dredging in the harbor of Mobile.

Post Office—Cynthiana, Ky.—(Official)—Bids were received as follows, June 17, by Oscar Wenderoth, Superv. Arch., Treas-

ury Dept., Washington, D. C., for the construction of a post office at Cynthiana: (a) Limestone; (b) sandstone: M. Yeager & Son, Danville, Ill., (a) $60,565; (b) $61,565; George W. Stiles Construction Co., Chicago, Ill., (a) $56,678; (b) $61,600; O. P. Raymond Lumber & Construction Co., Cynthiana, (a) $74,860.

Post Office—Du Quoin, Ill.—(Official)—Bids were received as follows, June 19, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post office at Du Quoin: (a) Limestone; (b) sandstone: August Ohm, Terre Haute, Ind., (a) $68,500; George W. Stiles Construction Co., Chicago, Ill., (a) $61,468; (b) $68,500; R. S. Moore, Lafayette, Ind., (a) $61,791; (b) $66,116; James Corse, Racine, Wis., (a) $61,000; (b) $64,000; Hiram Lloyd Building & Construction Co., St. Louis, Mo., (a) $66,215; (b) $68,215.

Post-Office—Rochelle, Ill.—(Official)—Bids were received as follows, June 17, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post-office at Rochelle: (a) limestone; (b) sandstone: James Corse, Racine, Wis., (a) $52,220; (b) $54,495; Alexander & Dinnie, Rockford, Ill., (a) $56,485; (b) $58,235; Barnes Bros., Logansport, Ind., (a) $54,000; (b) $55,900; Shegland & Widberg, De Kalb, Ill., (a) $73,992; (b) $74,342; George W. Stiles Construction Co., Chicago, Ill., (a) $52,995; (b) $55,600; W. J. McAlpine, Dixon, Ill., (a) $54,104; (b) $54,960; Israel Doan's Sons Co., Aurora, Ill., (a) $73,627; (b) $76,267; Hart Bros., Rockford, Ill., (a) $60,702; (b) $60,702.

Cement—Milwaukee, Wis.—(Official)—Bids were received June 16, by Lieut.-Col. George A. Zinn., Corps Engrs., U. S. A., Milwaukee, for 10,000 bbl. of cement (portland) for use at Sheboygan and Milwaukee, (a) 8000 bbl. at Sheboygan; (b) 8000 bbl. at Milwaukee; (c) credit for return of bags; (d) totals: Lehigh Portland Cement Co., Chicago, Ill., (Lehigh Brand), (a) $1.98; (b) $1.80; (c) 10c.; (d) $30,240; Alpha Portland Cement Co., Easton, Penn. (Alpha Brand), (a) $1.80; (b) $1.69; (c) 10c.; (d) $27,920; Atlas Portland Cement Co., New York City (Atlas Brand), (a) $1.82; (b) $1.80; (c) 10c.; (d) $28,960; Universal Portland Cement Co., Chicago, Ill. (Universal Brand) (a) $1.80; (b) $1.71; (c) 10c.; (d) $28,080; Western Lime & Cement Co., Milwaukee, Wis. (Huron Brand), (a) $1.80; (b) $1.69; (c) 10c.; (d) $27,920; Lake Shore Stone Co., Milwaukee, Wis. (Chicago AA Brand), (b) $1.77; (c) 10c.; (d) $14,160.

★Breakwater and Pile Pier—Sheboygan, Wis.—(Official)—Bids were received June 16, by Lieut.-Col. George A. Zinn, Corps Engrs., U. S. A., Milwaukee, Wis., for the construction of a reinforced concrete caisson breakwater and pile pier, removing old pier, and dredging at Sheboygan. The bids follow: Robert Love & Co., Muskegon, Mich., $223,465; Greiling Bros. Co., Green Bay, Wis., $162,970; Wisconsin Dredge & Dock Co., Sheboygan, Wis., $187,951; Muskegon Dock & Dredging Co., Muskegon, $177,365; Edward Eugene Gillen, Racine, Wis., $201,648; Great Lakes Dredge & Dock Co., Chicago, Ill., $204,654.

Repairs to Post Office—Sioux City, Iowa—Bids were received as follows, June 23, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for miscellaneous repairs to the post-office at Sioux City: William F. Hammel, Sioux City, $12,895; Dubel & Anderson, Sioux City, $13,187.

Post Office—Moorhead, Minn.—Bids were received as follows, June 23, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post office at Moorhead: (a) limestone; (b) sandstone: George W. Stiles Construction Co., Chicago, Ill., (a) $51.705; (b) $52,530; J. W. Miller, St. Paul, Minn., (a) $49,958; James Corse, Recine, Wis., (a) $49,967; (b) $50,400; American Construction Co., Milwaukee, Wis., (a) $49,800; (b) $50,360.

✚Buildings—White Earth, Minn.—The contract has been awarded to SCHULIND & CO., Alexandria, Minn., for the construction of the dormitory, mess hall, lighting system and laundry at the White Earth Indian School, White Earth, at $42,600. Bids were opened May 26. List of bidders noted June 5.

Sheet Piling—Plattsmouth, Neb.—G. J. S. Collins, Omaha, Neb., submitted a bid of $12,343, June 18, for wood sheet piling and approach at the post office at Plattsmouth. Bids were opened, June 18, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C.

✚Building—Wahpeton, N. D.—The contract has been awarded to R. K. HOFSES, Aberdeen, S. D., by the Commissioner of Indian Affairs, Washington, D. C., for the construction of a brick hospital at the Wahpeton Indian School.

Sluice and Penstock Gates—Elephant Butte, Mont.—(Official)—Bids will be received until 2 p.m., July 10, by the U. S. Reclamation Service, Elephant Butte, for furnishing sluice and penstock gates and accessories for Elephant Butte Dam, Rio Grande Project, New Mexico-Texas. This is an extension of date from June 25.

Post-Office Extension—St. Louis, Mo.—(Official)—Bids were received as follows, June 16, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of an extension to the post-office at St. Louis, Mo. Mississippi Valley Construction Co., St. Louis, $74,994; Hiram Lloyd Building & Construction Co., St. Louis, $72,317; Daniel Evans Construction Co., St. Louis, $70,900.

Jetty Work—Dallas, Tex.—Bids will be received by Maj. T. H. Jackson, Corps Engrs., U. S. A., Dallas, until noon, July 16, for jetty work at Sabine Pass, Tex.

★Pumping Plant, Etc.—Oklahoma City, Okla.—(Official)—Bids will be received until 3 p.m., July 25, by Oscar Wenderoth, Superv. Arch., Treasury Dept., Washington, D. C., for a pumping plant and a cooled drinking water supply system in the U. S. post office at Oklahoma City.

✚Reclamation—Palisade, Colo.—The Secretary of the Interior has awarded contract to the REYNOLDS ELY CONSTRUCTION CO., Springsville, Utah, for the excavation of the Cañon Division Main Canal, Grand Valley Irrigation Project, Colo. The division is five miles in length and its construction involves the excavation of 365,000 cu.yd. of material. The contract price is $109,568, subject to a possible reduction to $108,488 if a certain alternative is accepted, the choice of alternative methods depending upon the execution of a pending contract between the United States and the Rio Grande Junction R.R. Co. The canal is located between two and seven miles northeast of Palisade, Colo.

★Boilers, Generators, Etc.—Fort Bayard, N. M.—(Official)—Bids will be received until 10 a.m., July 9, for the sale of the following: Two Kewanee, return-tubular, 100-hp. boilers; two fifty kw. D. C. General Electric Co.'s engines and generators; switchboard complete for two generators; one 7½-ton York ice machine; one two-ton Shule ice machine, 99 50-lb. ice cans and two steam pumps 14x12x9 in. Information furnished on application to Lieut. C. E. Holmberg, Q. M., U. S. A., Fort Bayard.

Jetty Work, Aberdeen, Wash.—The U. S. government is considering extending the jetty at the bar one mile further out in order to insure a deeper channel.

Air Compressor—Bremerton, Wash.—Bids will be received until 11 a.m., July 12, by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for furnishing and installing one air compressor with at least 5300 cu.ft. of free air per min., complete with accessories, at the navy yard, Puget Sound, Bremerton. Estimated cost, $35,000.

Electric Traveling Cranes—Bremerton, Wash.—(Official)—Bids were received as follows, June 21, by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for the installation of electric traveling cranes at the Navy Yard, Puget Sound: Item (1), one 20-ton four-motor with five-ton auxiliary, one five-ton one-motor, one 3½-ton, three-motor traveling bridge cranes and one five-ton three-motor traveling wall crane; Item (2), deduction for omission of five-ton one-motor cranes; (Item (4), addition for one additional five-ton one-motor hand-traversing bridge crane; Cyclops Iron Works, 837 Folsom St., San Francisco, Calif., (1) $18,400; (2) $1900; (3) $4400; (4) $1900; Pawling & Harnischfeger, 38th & National Ave., Milwaukee, Wis., (1) $16,825; (2) $2725; (3) $3950; (4) $2675. Amount available, $10,000.

Dredging and Removing Rocks—Vallejo, Calif.—Bids will be received until 11 a.m., July 26, by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for dredging the channel and basin in Mare Island Strait, and removing rocks at Vallejo.

Electric Lamps, Motor Boats, Etc.—Panama—Bids will be received until 10:30 a.m., July 9, by Maj. F. C. Boggs, Corps Engrs., U .S. A., Chicago, Gen. Pur. Officer, Isthmian Canal Comn., Washington, D. C., for furnishing electric lamps, motor boats, switch stands, tie plates, etc.

✚Floating Caissons and Equipment—Panama—(Official)—Bids will be received until 10:30 a.m., July 21, by Maj. F. C. Boggs, Corps Engrs., U. S. A., Gen. Pur. Officer, Isthmian Canal Comn., Washington, D. C., for two lock entrance caissons and the equipment, under Circular No. 778.

✚Steel Barges—Panama—The contract has been awarded by the Isthmian Canal Commission, Washington, D. C., to the MARYLAND STEEL CO., Sparrow's Point, Md., for six steel dump barges under Circular 774, at $358,500. Bids were opened May 19. List of bidders noted May 22.

MISCELLANEOUS

Dam—Waterville, Maine—The Lockwood Co., whose cotton mills are located on the falls of the Kennebec River, in Waterville, has decided to proceed with the construction of the new dam for which plans recently were completed. It will be 885 ft. long, of reinforced concrete, taking the place of a wooden structure.

✚Dredging—Boston, Mass.—The State Board of Harbor and Land Commissioners, Boston, has awarded the following contracts, bids opened May 28: Saugus River, dredging, to the BAY STATE DREDGING CO., LTD., 247 Atlantic Ave., Boston; Lynn Harbor, dredging, to J. P. O'RIORDEN, 6 City Sq., Charlestown, Mass.; Manchester Harbor, widening channel and dredging anchorage basin, to the EASTERN DREDGING CO., 247 Atlantic Ave., Boston; South River, Salem, dredging, to EASTERN DREDGING CO.

✚Walls and Grading—Boston, Mass.—The contract has been awarded to the J. C. COLEMAN & SONS CO., by the Park and Recreation Department for grading and constructing walls at the Mount Ida Playground, at $20,555.

Fire Station—Holyoke, Mass.—Plans are being prepared, and bids will be asked about July 20, for the construction of the central fire station on Maple St. It will be 82x90 ft., four stories, of brick and limestone. Oscar Beauchemin is Arch.

Buildings—Ipswich Beach, Mass.—(Official)—Bids will be received after June 26 by J. F. Le Baron, Engr. and Proprietor, Common Point, Essex, Mass., for the construction of a small two-story reinforced concrete cottage, garage, stable, boat-house and wharf on Ipswich Beach.

✚Swimming Pool—Northampton, Mass.—The contract has been awarded to J. L. MATHER, Northampton, for the construction of the swimming pool and for other improvements for the Y. M. C. A., at $25,000.

Harbor Work—Plymouth, Mass.—Governor Foss has sent to the State Legislature a special message calling for an appropriation of $83,500 for improvements at Plymouth Harbor, which sum must be appropriated by the state to secure an equal sum for the same purpose appropriated by U. S. Government.

Elimination of Grade Crossing—Torrington, Conn.—The borough authorities and the New York, New Haven & Hartford R.R. Co. are planning the elimination of a grade crossing on North Elm St. The cost is estimated at about $80,000. Edward Gagel is Ch. Engr. N. Y., N. H. & H. R.R., New Haven, Conn.

★Clock System—Albany, N. Y.—(Official)—Bids will be received until 4 p.m., July 21, by the Trustees of Public Buildings, Albany, for a central energy clock system for the State Education Building. Lewis F. Pilcher is State Arch.

✚Shaft Sinking—New York, N. Y.—(Official)—Contractors wishing to bid on sinking an inclined shaft (60 degrees) 8x20 about 1000 ft. deep, granite rock, eastern location, may communicate with P. 1089. Engineering News, New York.

Subway—New York, N. Y.—Bids were opened June 24 for Section 4 of the Broadway-Fourth Ave. Subway to be operated by the Municipal Ry. Corp. (B. R. T.), extending from a point about midway between Houston and Bleecker St. to a point in Broadway 390 ft. north of 14th St. The unofficial totals are as follows: Dock Contractor Co. (Hoboken), 2 Rector St., New York City, $2,578,000; Oscar Daniels Co., Woolworth Bldg., New York City, $2,650,000; Degnon Contracting Co., 60 Wall St., New York City, $2,735,000; Underpinning & Foundation Co., 290 Broadway, New York City, $2,749,000; Mason & Hanger Co., Van Cortlandt Park, New York City, $2,758,000; E. E. Smith Contracting Co., 101 Park Ave., New York City, $2,799,000; Holbrook, Cabot & Rollins Corporation, 331 Madison Ave., New York City, $2,841,000; Cranford Co., 190 Montague St., Brooklyn, N. Y., $2,861,000; Godwin Construction Co., 251 Fourth Ave., New York City, $3,048,000; Booth & Flynn (Pittsburgh), 3785 Broadway, New York City, $3,136,000; J. F. Cogan Co., contractors, Woolworth Bldg., New York City, $3,310,000.

Subways—Philadelphia, Penn.—The lower house of the State Legislature has passed the bill authorizing the city to build subways for leasing purposes, and gives the Council control over the leases and contracts. Under its provision work must start within 18 months.

Engine House—Pittsburgh, Penn.—John P. Brennen, Arch., City Hall, North Side, is preparing plans for an engine house on Webster Ave., to cost $60,000. The building will be of brick, two stories, and fireproof.

Retaining Wall—Verona, Penn.—Bids will be received until noon, June 26, by Frank, Lloyd & Stophlet, Archs., 1100 House Bldg., Pittsburgh, Penn., for the construction of a retaining wall at Verona.

Fire Hose—Washington, D. C.—Bids will be received until 2 p.m., June 27, by the Commissioners of the District of Columbia, Washington, for furnishing and delivering 15,000 ft. of 2½-in. fire hose.

✚Canal—Norfolk, Va.—The contract has been awarded to the Brett Engineering Co., Wilson, N. C., by Parksville Drainage District No. 1, for the construction of about 10 miles of drainage canals. The work will require the excavation of about 262,000 cu.yd. Bids were received June 11.

Levees—New Orleans, La.—Contracts for levee bids opened June 9 have been awarded as follows: For the Vaucluse Levee, Lots 1 and 2, to FRANCIS T. CONSTANT, Alexandria, at 34c. per cu.yd.; totals, $58,820 and $57,120, respectively; for the Ingefield Levee, Lots 2, 3 and 4, to B. T. CLARK & CO., Natchez, Miss., at 29⅞c. and 29.16c. per cu.yd.; totals, $38,199, $38,054 and $37,762, respectively.

Wall and Fill—Cincinnati, Ohio—Bids will be received by the County Commissioners until noon, July 11, for the construction of a concrete wall and fill on Hillside Ave. at Rapid Run, Delhi Township. Albert Reinhardt is Clk.

Elimination of Grade Crossings—Cincinnati, Ohio—The city is considering the elimination of grade crossings on the Cncinnati, Hamilton & Dayton Ry.

Ditch—Anderson, Ind.—Bids will be received until July 5 by the County Surveyor, Anderson, for constructing the George Hertzel Ditch, 10,880 lin.ft. 20-, 22- and 24-in. drain tile and the removal of 38,451 cu.yd. of earth.

✚Ditch—Brownstown, Ind.—F. C. MORGAN, Vincennes, Ind., has been awarded the contract at 8.1c. per cu.yd., for constructing the Rider Ditch and branches, bids opened May 29 at Brownstown by S. Carr, Engr.-Supt.

Drydock—Evansville, Ind.—Thomas Crozier, Evansville, is organizing a company for the purpose of constructing a drydock here.

Removal of Bypass—Chicago, Ill.—(Official)—Bids were received as follows, June 19, by the Sanitary District of Chicago for the removal of the bypass at and north of Jackson St.: Great Lakes Dredge & Dock Co., Chicago, $17,900 and $18,900; Byrne Bros. Dredging & Engineering Co., Chicago, $31,323 and $34,711.

Channel Work—Chicago, Ill.—(Official)—Bids were received as follows by the Sanitary District of Chicago, June 19, for the excavation and construction of Contract Sections 7 and 8 of the Calumet Sag Channel: (a) Section 7; (b) Section 8; (c) Sections 7 and 8: Green & Sons Co., Chicago, (c) $1,065,039; Bryne Bros. Dredging & Engineering Co., Chicago, (a) $529,150; (b) $1,550,197; (c) $1,071,672; Great Lakes Dredge & Dock Co., Chicago, (c) $1,296,551; T. W. Keys, La Salle, Ill., (a) $766,150; (b) $781,330; (c) 1,547,480.

Dredging—Milwaukee, Wis.—A. F. Bues was the only bidder for dredging the navigable streams of Milwaukee at 14c. per cu.yd. The city will spend about $30,000 for dredging this year.

Coal Trestle—Two Harbors, Wis.—Plans have been completed for the construction of a coal trestle for the city. Bids will be received soon for a wood or a steel superstructure with concrete base.

Drain Work—Fort Dodge, Iowa—Bids will be received until 10 a.m., June 28, by J. L. Hanrahan, County Audr., Fort Dodge, for the construction of tile branches known as Sects. 8, 9, 16, 17, 18, 19, 20, 21 and 22 of Drain 96. Estimated cost, including labor, $38,143.

✚Ditch—Blue Earth, Minn.—Contracts for constructing Ditch 14 have been awarded as follows: Open work, to MELGREW & BOYCE, Dubuque, Iowa, at $6500; Clear Lake, Iowa, $59,500. Robt. B. Miller, of Blue Earth, is Engr.

Ditch Work—Crookston, Minn.—No bids were received June 11, by H. J. Welte, County Audr., Crookston, for finishing Ditches 63 and 64.

Ditch—Crookston, Minn.—The Commissioners of Polk County are considering the construction of a ditch. H. J. Welto is County Audr.

Sprinkler System—Minneapolis, Minn.—Bids will be received until June 26 at the office of the Controller of the University of Minnesota, for installing sprinkler systems in four buildings at the University.

✚Ditch—Warren, Minn.—The contract has been awarded to SMALL & McMAHON, Aitkin, Minn., for the construction of Ditch No. 28, at $26,000. The work will require the excavation of about 220,214 cu.yd.

Telephone System—Mitchell, S. D.—On June 10 the proposition to issue $60,000 of bonds for a municipal telephone system was carried.

★Ditch and Levee Work—Elsberry, Mo.—Bids will be received at the office of James G. Welch, Secy., Elsberry, by the Commissioners of the Elsberry Drainage District, until 11 a.m., July 8, for ditch and levee work aggregating 920,000 cu.yd. The Harman Engineering Co., Peoria, Ill., Engr. will furnish further information upon inquiry.

Drainage Work—Houston, Tex.—The property owners of Drainage District No. 7 have voted to issue $140,000 of bonds for drainage improvements.

Comfort Stations—Salt Lake City, Utah—The city will erect two public comfort stations. Estimated cost, about $10,000. Bids will be asked soon.

Dock—Portland, Ore.—Plans are nearing completion for the construction of the West Side dock. Bids will be asked soon. G. B. Hegardt is Ch. Engr. Dock Comn.

Wharf—Oakland, Calif.—The Southern Pacific Co. is planning for the construction of new wharves at Oakland. W. Hood, San Francisco, Calif., is Ch. Engr.

Levees—Sacramento, Calif.—Bids will be received about July 15 by the City Engineer for the construction of levees along the Sacramento River. Estimated cost, $900,000.

Subway—Bridgeburg, Ont.—Surveys are being made for the construction of the proposed subway at the Thompson grade crossing. Estimated cost, $50,000. The cost will be born by the Railway Commission, the Grand Trunk Ry., the Michigan Central R.R. and the township of Bertie.

✚Lock Gates—Ottawa, Ont.—(Official)—The contract has been awarded to ROGER MILLER & SON, Toronto, Ont., for lock gates for the Ontario-Rice Lake Division of the Trent Canal. Bids were opened by R. C. Desrochers, Secy. Dept. Pub. Wks.

Wharf Extension—Sea Gull, Ont.—Bids will be received until July 14 by R. C. Desrochers, Secy. Dept. Pub. Wks., Ottawa, Ont., for constructing an extension to the wharf at Sea Gull, St. Joseph's Island, District of Algoma, Ont.

★✚Dredging—Toronto, Ont.—The contract has been awarded by the Port Commission of Toronto to the CANADIAN STEWART CO., Montreal, Que., for dredging about 30,000,000 cu.yd. in the harbor. Noted June 12.

Harbor Work—Toronto, Ont.—The Department of Public Works, Ottawa, Ont., has voted in favor of aiding the Toronto Harbor Commission in its harbor improvement work to the extent of $500,000. R. C. Desrochers is Secy., Ottawa.

Harbor Work—Whitby, Ont.—The Canadian Government is planning to enlarge the harbor at Whitby, Ont., at a cost of about $20,000. R. C. Desrochers, Ottawa, Ont., is Secy. Dept. Pub. Wks.

Observatory—Victoria, B. C.—Bids will be receivd until July 2 by R. C. Dsrochrs, Scy. Dpt. Pub. Wks., Otawa, On., for h consrucion of an obsrvaory at Gonzales Heights, Victoria.

✚Lock System—Victoria, B. C.—The Canadian Government has awarded the contract to the ELEVATORS SUPPLY & EQUIPMENT CO., for the installation of a patent lock system in the new jail, at $25,000.

Jetty—Steveston, B. C.—Bids will be received until July 2 by R. C. Desrochers, Secy. Dept. Pub. Wks., Ottawa, Ont., for completing the jetty at Steveston, at the mouth of the Fraser River, New Westminister. This is an extension from June 17.

Breakwater—Parker's Cove, N. S.—Bids will be received until June 30, by R. C. Resrochers, Secy. Dept Pub. Wks., Ottawa, Ont., for constructing a breakwater at Parker's Cove.

Wharf—White's Bluff, N. B.—Bids will be received until July 9 by R. C. Desrochers, Secy. Dept. Pub. Wks., Ottawa, Ont., for the construction of a wharf at White's Bluff.

Car Ferry Terminal—Carleton, P. E. I.—Bids will be received until Juyl 2 by the Department of Railways and Canals, Ottawa, Ont., for donstrulting a car ferry terminal at Carleton Point, P. E. I. This is a readvertisement as the contract recently awarded was abandoned.

BUILDINGS

Durham, N. H.—James H. Richie, Arch., 8 Beacon St., Boston, Mass., is preparing plans for the construction of the engineering building for the New Hampshire State College. The estimated cost is $80,000.

✚Athol, Mass.—The contract for building a block on Main St. for L. S. Starrett has been awarded to L. B. TAYLOR. It will be 88x106 ft., three stories, of brick and limestone. Funk & Wilcox, 15 Beacon St., Boston, are Archs.

✚Boston, Mass.—The contract for the construction of the 10-story building for Houghton & Dutton at Tremont and Beacon Sts., has been awarded to the GEO. W. HARVEY CO., 201 Devonshire St.

Boston, Mass.—The City Council, June 13, decided to negotiate a loan of $298,000, for new buildings, changes and additions at City Hospital and $22,000 (additional) for municipal building in Ward 7. M. J. Fish is Supt. of Pub. Bldg.

Plans are ready for bids for the $150,000 station for the Boston & Maine R.R. to be erected at Clinton. R. C. Reamer, Boston, Mass., is Arch.

Fall River, Mass.—A five-story steel frame addition to the Notre Dame Parish Home will be erected. It will be 50x135 ft. Louis G. Destremp is Arch., 56 North Main St.

Holyoke, Mass.—Bids will be received until June 27, for the high school gymnasium to be built at Pine and Beach Sts. W. B. Reid is Arch., 280 High St. Noted June 5.

Marblehead, Mass.—Vroom Bros., Lynn, Mass., it is reported, have filed a petition in the Essex Superior Court asking an injunction to restrain the town of Marblehead from awarding contract to build the new high school to McGahey & Connor, Boston, Mass., who bid $79,000. Vroom Bros. bid $78,529. Noted May 22.

✚Methuen, Mass.—The contract for the construction of the school on Ashford St. has been awarded to E. A. PEABODY & SON, Bay State Bldg. It will be two stories, of brick, with boiler house included.

North Adams, Mass.—Plans are being prepared for a three-story high school. Bids will be asked about Aug. 1. E. C. & G. C. Gardner are Archs.

Springfield, Mass.—A five-story office building is being planned at Stearns Park, for Frank L. Dunlap, 274 Main St. It will be 60x100 ft., of brick E. C. & G. C. Gardner are Archs., 33 Lyman St.

Springfield, Mass.—Wood Williams, Williams Dental and Surgical depot, has purchased the Stearns Park Hotel property for $100,000 and will erect upon the site a five-story business block, 100x60 ft.

✚Providence, R. I.—The contract for building an apartment house on Whitmarsh St., for Manuel F. Williams has been awarded to JOHN McLEOD, 511 Hope St. It will be 65x200 ft., three stories, of brick and terra cotta. Frank W. Woods, 212 Union St., is Arch.

✚The contract for the construction of the gymnasium for St. George's School has been awarded to WILLIAM WILLIAMS, 86 Weybosset St., Providence. It will be 45x128 ft., of brick and steel, 2½ stories.

✚Hartford, Conn.—Contracts for the construction of the addition to the Northeast School District buildings have been awarded as follows: Masonry, A. L. HILLS, Hartford, Conn., carpentry; ALEXANDER HEPBURN, Hartford, Conn., steel; BERLIN CONSTRUCTION CO., Berlin, Conn., tile and marble work; WHITE & CLARK, Hartford, Conn.

✚New Britain, Conn.—The contract for the storage building to be erected on Elm St. for Landers, Prary & Clark, has been awarded to the TORRINGTON BUILDING CO. It will be of brick, 42x260 ft., two stories, of mill construction. Unkelbach & Perry are Archs., 162 Main St.

Brooklyn, N. Y.—Plans have been filed for the construction of the telephone building at Lorimer St., and Boerum Place, for the New York & New Jersey Telephone Co. The estimated cost is $100,000.

✚Buffalo, N. Y.—The general contract for the construction of the eight-story department store to be erected at Washington and North Division Sts., for Wilson & Smith, 515 Mutual Life Bldg., has been awarded to JAMES N. BYERS.

✚Hudson, N. Y.—The following contracts have been awarded by the State Architect at the N. Y. State Training School for Girls at Hudson. Construction of cottages 13 and 14, and conduits, to the BARRIGAN CONTRACTING CO., of Little Falls, $44,700. Plumbing work of cottages 13 and 14 to P. C. DOHERTY, of Poughkeepsie, $4378. Installation of the hot water and circulating piping in the new main conduit to THOMAS A. O'MALLEY, of Albany, $586; electric work of cottages 13 and 14 to T. FREDERICK JACKSON, INC., New York City, $5087. Construction of the new school building to D. W. DEAN, of Olean, $53,713. Heating of the school building to J. J. HORAN & CO., of Troy, at $4390. Electric work for the new school building to PETER KEELER BUILDING CO., at $2420. For the heating work, conduits, including the pressure reducing valves, to the W. B. ARMSTRONG CO., of Albany, $5630. Also heating work at $3947. Noted May 15.

✚Malone, N. Y.—The contract for the construction of the hotel at Malone for Flannigan Bros. has been awarded to F. A. CASWELL, Watertown, N. Y.

Ithaca, N. Y.—(Official)—Bids will be received about July 10, by Gibb & Waltz, Archs., Trust Co. Bldg., Ithaca, N. Y., for the construction of a fraternity house for the Delta Chi Fraternity. The estimated cost is $40,000. Noted June 19.

(Official)—Bids will be received about June 30, by Gibb & Waltz, Archs., Trust Co. Bldg., Ithaca, for the construction of the department store for Rothschild Bros. The estimated cost is $75,000.

✚New York, N. Y.—The contract for driving the steel pile foundation for the 12-story apartment hotel to be erected at Park Ave. and 77th St., has been awarded to the UNDERPINNING & FOUNDATION CO., 290 Broadway, New York. Noted May 15.

Plans have been filed for the construction of a six-story hospital at Edgecomb Ave., between 163rd and 164th Sts., for St. Lawrence Hospital. The estimated cost is $500,000.

Plans have been filed by V. Hugo Koehler, Arch., 489 Fifth Ave., for the construction of an office and store building at Broadway and 107th St., for the Aetna Amusement Corporation. The estimated cost is $100,000.

Plans have been filed by Wallis & Goodwillie, Archs., 346 Fourth Ave., for the construction of a 12-story loft building at 33d St. and Madison Ave., for the East 33d St. Ry. Co. The estimated cost is $400,000.

Plans have been filed by Wallis & Goodwillie, Archs., 346 Fourth Ave., for the construction of an eight-story apartment house, 50x85 ft., at 124 West 55th St., for the George Barker Construction Co. The estimated cost is $140,000.

✚Niagara Falls, N. Y.—The general contract for the construction of the Alumni Building at Niagara University, has been awarded to JOHN LENNON & SONS, 1328 South Ave., Niagara Falls, N. Y. Noted Apr. 10.

✚Potsdam, N. Y.—A contract has been awarded to L. B. CLEVELAND, by the New York Central & Hudson River R.R. Co. for the proposed passenger station at Potsdam.

★Schenectady, N. Y.—Bids will be received until 2:30 p.m., July 23, by the Fred E. Johnson, Secy., Board of Contract & Supply, City Hall, for the construction, including plumbing and gas fitting, heating and ventilating and electrical work of the three schools for the Second, Ninth and Tenth Wards, Schenectady, N. Y. W. Thomas Wooley is Arch., 447 Franklin St.

✚Sherrill, N. Y.—The fireproofing contract in connection with new building being erected by the Oneida Community Co. at Sherrill, has been sublet to the ROEBLING CONSTRUCTION CO., Erie County Bank Building, Buffalo, N. Y.

✚The contract for steel work, amounting to about 600 tons, for the building to be erected at Sherrill, by the Oneida Community Co., Ltd., has been sublet to the AMERICAN BRIDGE CO., 30 Church St., New York.

Syracuse, N. Y.—The lowest bidder for the construction of the poultry building at the State Fair Grounds was the Peter Keeler Building Co., Albany, N. Y., at $76,350, and Burns Bros., Syracuse, at $3313, for plumbing work. Noted May 29.

✚Newark, N. J.—Contracts for the completion of the Cathedral of the Sacred Heart, have been awarded to E. M. WALDRON, of Newark, and the WEBB GRANITE & CONSTRUCTION CO., Worcester, Mass. The total of the two contracts is $1,000,000.

✚The contract for furnishing between 1300 and 1400 tons of structural steel for the Military Plaza Hotel, has been awarded to the HEDDEN IRON CO., 1 Madison Ave., New York.

Greensburg, Penn.—Paul A. Bartholomew, Arch., will prepare plans for a 2½-story brick school at Pittsburgh and Maple Sts. to cost $40,000.

Millvale, Penn.—J. T. Comes, Arch., 1005 Fifth Ave., Pittsburgh, has completed plans for a two-story brick and stone fireproof church and parsonage for St. Anthony's Congregation, North Ave. The estimated cost is $125,000.

✚Hazleton, Penn.—The contract for the construction of the industrial building, school house, refrigerating house, and a barn at the Luzerne County Home and School for Boys, has been awarded to W. H. SHEPHERD & SONS, Wilkes-Barre, Penn., at $40,500. Other bidders follow: Herman Mailander, Wilkes-Barre, $46,930; S. Y. Frederick & Son, Hazleton, $47,600; H. L. Campbell, Hazleton, $45,000; James M. Boyle, Freeland, $52,420; J. M. Leach, Jr., Wilkes-Barre, $41,470; W. H. Shepherd & Sons, Wilker-Barre, $40,500.

New Castle, Penn.—Bids will be received about July 1, by Frank Foulk, Arch., Pearson Block, for the construction of a club house for the B. P. O. E. It will be three stories and basement, 75x90 ft., of brick and stone. The estimated cost is $50,000. Noted May 8.

New Eagle, Penn.—Bids will be received until 7 p.m., June 27, by William Pickering, Chn. of Com. on Pub. Property, New Eagle, Penn., for the construction of a brick municipal building.

Philadelphia, Penn.—Bids are being received by Hewitt, Granger & Paist, Archs., for the construction of the Jewish Maternity Hospital, at 532 Spruce St. It will be four stories, 46x97 ft. The estimated cost is $40,000.

The Board of Education will expend $200,000 for repairs to various school buildings.

Pittsburgh, Penn.—John T. Comes, Arch., 1005 Fifth Ave., has prepared plans for the construction of a church on North Ave., for St. Anthony's congregation. The estimated cost is $125,000.

Plans are being prepared for the construction of the freight house at North Canal and Anderson Sts., for the Pennsylvania R.R. It will be four stories, of brick. The estimated cost is $337,000.

Pittsburgh, Penn.—Ellsworth Dean, Arch., Fitzsimmons Bldg., Fourth Ave., is preparing plans for remodeling the Bakewell building, Grant and Diamond Sts. A three-story addition 22x90 ft., will be built. It will have stone foundations, tile floors and partitions, composition roofing, etc.

Pittsburgh Hospital, Sisters of Charity, will build an additional wing to the building in Frankstown Ave., to cost $200,000. The architects have not yet been selected.

✚Sunbury, Penn.—The contract for remodeling and rebuilding the Northumberland County court house has been awarded to the SHAMOKIN LUMBER & MFG. CO., Shamokin, at $60,400.

Georgetown, Del.—Brinckloe & Canning, Archs., Wilmington, are preparing plans for remodeling and enlarging the Sussex County court house.

Baltimore, Md.—J. Appleton Wilson, Arch., 800 Law Bldg., is preparing plans for the construction of the Pratt Library on West North Ave.

Petersburg, Va.—(Official)—Bids will be received until noon, June 30, by A. T. Shepherd & Charles K. Bryant, Archs., Richmond, Va., for the construction of the Sycamore apartments, at Petersburg. The estimated cost is $75,000. Noted June 5.

Richmond, Va.—The Virginia Building Corporation will erect a 22-story office building at 11th and Main Sts. The estimated cost is $400,000. H. L. Denoon is Pres.

✚Raleigh, N. C.—The North Carolina State Fair awarded the contract for the construction of the buildings at the State Fair to W. B. BARROW, Raleigh, N. C.

✚Winston Salem, N. C.—The contract for the construction of the hospital at Winston Salem, has been awarded to J. A. JONES, Charlotte, N. C., at $90,000. Noted May 22.

✚Augusta, Ga.—The contract for the construction of the hotel to be erected at City Park, for the Lawrence Hotel Co., has been awarded to C. W. REQUARTH CO., 1210 Commercial Bldg., Charlotte, N. C. The estimated cost is $250,000. Bellomby & Whaley, are Archs., Augusta, Ga.

✚Savannah, Ga.—The contract for the construction of the Masonic Temple, has been awarded to E. MORGAN, Savannah, Ga. The estimated cost is $200,000.

Laurel, Miss.—The Y. M. C. A. will erect a new home at a cost of $50,000.

+New Orleans, La.—The contract for the alterations to the Y. M. C. A., building has been awarded to H. F. HINRICHS, New Orleans, La.

Grayson Springs, Ky.—J. G. Gallagher, Louisville, Ky., is interested in the organization of the Grayson Springs Hotel Co., which will establish a $250,000 hotel and summer resort at Grayson Springs, Ky.

Cincinnati, Ohio—The Jacob Vossler Co., manufacturer of cheese, etc., will build a four-story warehouse on Court St. between Central Ave. and John St. It will be heavy mill construction 22x100 ft. Anton Reig, is Arch. 2554 Vine St.

+The general contract has been awarded to GRIFFITH & SONS CO., Cincinnati for the $350,000 addition and alteration to the John Shillito Co. store at Seventh & Race Sts. Six new elevators will be installed.

The Provident Savings Bank & Trust Co., Cincinnati, Ohio, has acquired a site adjoining its present building, and is considering the erection of a 12-story addition.

J. Stacey Hill, owner of the Hotel Gibson, Cincinnati, Ohio, who has been building a four-story addition, has announced that this will be increased to 12 stories. G. W. Drach, Arch., will receive bids at once.

The Union Savings Bank & Trust Co., Cincinnati, has had plans prepared for the erection of an 18-story addition.

+Cleveland, Ohio—The contract for the construction of the department store building, at Prospect Ave. and Ontario St., for May Bros., has been awarded to the BLACK CONSTRUCTION CO., St. Louis, Mo. Noted Apr. 3.

Columbus, Ohio—Bids will be asked at once for the construction of a $175,000 school to be erected by the Board of Education on Studer Ave.

+Columbus, Ohio—The contract for the construction of the eight-story department store to be erected on High St., for Z. P. White, has been awarded to C. F. HANSBERGER, Columbus, Ohio.

Hamilton, Ohio—Bids will be received until June 27, by F. L. Packard, Arch., New Hayden Bldg., Columbus, Ohio, for the construction of a school at Hamilton. Noted Jun. 12.

Chicago, Ill.—Patterson & Davidson, Archs., 53 West Jackson Blvd., have prepared plans for the construction of a 16-story building at Madison and Franklin Sts., to be known as the Shoe & Leather Exchange. The estimated cost is $1,800,000.

The Central Forwarding Co. will erect a warehouse at Iron and 36th Sts. and the River. It will be five stories, 100x250 ft. The estimated cost is $200,000.

...Evanston, Ill.—Bids will be received about July 10, by Meyer J. Strum, Arch., 116 South Michigan Ave., Chicago, Ill., for the construction of the Evanston Hospital. The estimated cost is $125,000. Noted June 5.

Hartford, Wis.—Plans have been prepared for a two-story and basement school by R. Messmer & Bros., Archs., 1004 Majestic Bldg., Milwaukee. C. L. Friday is Clerk. Cost, $40,000.

Madison, Wis.—J. N. Cady, Arch., is planning a large store building to be erected for Alexander Kornhauser. The estimated cost is $50,000.

West Allis, Wis.—Bids were received as follows, for the erection of an addition to the Lincoln School. General construction work received only one bid, from A. Tady, at $24,222; plumbing, Polacheck & Johnson, $6875; Neis-Freund Co., $6500; Wauwatosa Hardware Co., $6750; heating, Downey Heating & Supply Co., $8100; electric wiring, Wisconsin Equipment Co., $630. No recommendations were made. Chandler & Park are Archs., Racine, Wis.

+Des Moines, Iowa—The contract for the construction of the addition to the Park Ave. School has been awarded to BENSON & MARXER, at $38,094, and the contract for plumbing, heating and lighting to PRAY & CUMERFORD, at $9916. Proudfoot, Bird & Rawson are Archs., 625 Flynn Block.

St. Paul, Minn.—Granger & Frost, Archs., 806 The Temple, are preparing plans for the construction of a 20-story office building at Fourth and Jackson Sts., for James J. Hill. Noted Apr. 24.

Winona, Minn.—Bids were received as follows, for the construction of the county jail: A. C. Thomas, St. Paul, $49,496; John Lohse, Winona, $49,651; Seidlitz & Werner, Winona, $54,100; H. W. Jackson, St. Paul, $49,700.

Joplin, Mo.—Shattuck & Hussey, 19 South La Salle, St., Chicago, Ill., are preparing plans for the construction of a Y. M. C. A. building, at Joplin. The estimated cost is $125,000.

+St. Louis, Mo.—The contract for the construction of the church at Grand Ave. and Emily St., has been awarded to JOHN COSTELLO & SON, 251 St. Louis Ave., at $62,300.

Plans have been prepared by Herman Lee Meader, Arch., 178 Fifth Ave., New York, for the construction of a hotel at 12th and Olive Sts. It will be 10 stories, of brick and steel. Henry Blodgett, Third National Bank Bldg., is interested.

+The contract for the construction of the hospital addition on Delmar Ave., for St. Luke's Hospital, has been awarded to the W. M. SUTHERLAND BUILDING & CONSTRUCTION CO., St. Louis. The estimated cost is $150,000.

Abilene, Tex.—Plans have been approved by the County Commissioners for the construction of Taylor County court house. George Burnett is Arch., Waco, Tex.

Corpus Christi, Tex.—An election of taxpayers of Nueces County will be held July 19, to vote on the proposition of issuing $250,000 in bonds for the erection of a new county court-house and jail, and $500,000 of bonds for constructing 200 miles of good roads.

+Dallas, Tex.—The contract for the construction of the four-story and basement building at Elm and Griffin Sts., for the Huey & Philip Hardware Co., has been awarded to the ALEX WATSON CONSTRUCTION CO., Dallas.

Denver, Colo.—The Denver Union Stock Yards will erect an exhibition building, at Denver. It will be three stories, 60x100 ft. The estimated cost is $75,000.

Phoenix, Ariz.—Bids will be received July 18, by the Trustees of Phoenix School District for the construction of a two-story and basement brick grammar school. Norman F. Marsh, Broadway Central Bldg., Los Angeles, is Arch. It will be 280x120 ft., with pressed brick exterior, slate and composition roof, hollow tile and metal lath partitions, cement and tile floors.

Wenatchee, Wash.—The Wenatchee Growers' Exchange will build a $40,000 warehouse at Yakima and Wenatchee Aves. Bebb & Mendel are Archs., Denno Bldg., Seattle, Wash.

Los Angeles, Calif.—(Official)—Bids will be received until noon, July 15, by George W. Eldredge, Arch., 521 Los Angeles Investment Bldg., for the construction of the Huntington Park Union High School. The estimated cost is $100,000. Noted June 12.

The Alta Planing Mill Co., 830 McGary St., was the lowest bidder at $499,885 for the erection of a group of nine buildings at Vermont and Willowbrook Aves., for the Los Angeles State Normal School. Other bidders were as follows: Southwestern Construction Co., $504,000; Lewis A. Hicks Co., $531,000; Los Angeles Planing Mill Co., $533,500; and C. J. Kubach Co., $537,900. Allison & Allison are Archs., Hibernian Bldg.

San Diego, Calif.—The Wurster Construction Co., Spreckels Bldg., San Diego, was the lowest bidder at $272,000, for the construction of the California State building at the San Diego Exposition. Other bidders were: F. O. Engstrum Co., $284,000; Klein & O'Brein, $289,412. B. G. Goodhue is Arch. Noted June 5.

San Francisco, Calif.—The lowest bidder for furnishing the structural steel to be used in the construction of the city hall, was the United Steel Products Co., at $476,283. Other bidders were: Phoenix Iron Co., $545,000; Union Iron Works, $571,000; Pacific Rolling Mills, $532,000; Dyer Bros., $585,099. Noted May 29.

+The following contracts have been awarded by the Directors of the Panama Pacific Exposition Co., in connection with the construction of the buildings on the fair grounds: Plumbing contract, for Transportation Building, to JOHN G. SUTTON CO., at $17,384; pile foundation contracts for Mines Building and Varied Industries Building, to HEALY TIBBITTS CO., 8 Main St., at $28,426; erection of the Manufacturers Building, to McLERAN & PETERSON, Sharon Bldg., at $210,326.

San Francisco, Calif.—The San Francisco Medical Society will erect a 13-story and basement office building at Northeast Post and Powell Sts. to cost about $1,250,000. Ward & Blome, 310 Sansome St., are Archs.

+San José, Calif.—The general contract for the construction of the Hester School has been awarded to ROBINSON & PLACE, Okland, Calif., at $60,950. The heating contract was let to the PACIFIC HEATING & BLOWER CO., San Francisco, at $5200.

+The Board of Public Works has awarded the contract for the erection of the Edison School at 22d and Church Sts., to MONSON BROS., at $42,677. Noted June 19.

+Montreal, Que.—The contract for the construction of the 10-story office building at Beaver Hall Hill, for the Guarantee Co., of North America, has been awarded to the GEORGE A. FULLER CO., 369 St. Catherine St., West.

INDUSTRIAL WORKS

Fairfield, Maine—The Keyes Pulp & Fibre Co., W. L. Keyes, Pres., is having plans prepared for an addition to its plant, which will be 90x228 ft., two stories, of brick.

Springfield, Vt.—The John T. Slack Co., Springfield, Vt., will build a one-story brick addition to its carding department, 228x47 ft.

Boston, Mass.—William Crane, Boston, has purchased a site on Heywood St., and will erect a four-story factory building.

Gardner, Mass.—Frank M. Flavor will build a three-story brick factory, 40x100 ft., to manufacture building material and inside finish.

Bridgeport, Conn.—Plans are being prepared for the proposed addition to the plant of the Frisbie Pie Co., on Kossuth St. It will be 50x100 ft., of brick and wood, three stories, mill construction. Leonard Asheim is Arch.

The Belknap Mfg. Co. has purchased a site on Holland St. for a three-story brick factory, 50x320 ft.

Naugatuck, Conn.—The United States Rubber Co. will erect a two-story brick and steel manufacturing addition to its reclaiming plant, to cost $75,000.

New Britain, Conn.—Plans have been prepared for an addition to the factory of Landers, Tracy & Clark, and bids will be received at once for a building about 30x70 ft., two stories, of brick, mill construction. Unkelbach & Perry, 162 Main St., New Britain, are Archs.

Torrington, Conn.—The Progressive Mfg. Co. will erect a two-story brick factory, 30x152 ft., to its plant at this city.

Waterbury, Conn.—Plans are being prepared for a factory building to be erected on North Elm St., for the General Mfg. Co. It will be 28x77 ft., two stories and basement, of Brick.

Buchanan, N. Y.—Edwin A. & H. Lansing, Quick Archs., have prepared plans for a factory one and two stories, 696x1920 ft., to be built by the Standard Oil Cloth Co. 320 Broadway, New York City, at an estimated cost of $600,000.

Buffalo, N. Y.—The McCue Co., manufacturers of automobile axles, forgings and gears, will build an extensive addition to its machine shop and drop forge plant at Elmwood Ave., Grate St., and the New York Central R.R. C. T. McCue is Pres. and Gen. Mgr.

Victor H. Canahan & Co., West and Forest Aves., is having plans prepared by Emerson C. Dell, Arch., for a 2-story and basement factory 45x98 ft., to be built at once. It will be of brick-mill construction.

+The Aluminum Castings Co., Rogers C. Adams, Mgr. will build an addition to its Elmwood plant, Elmwood Ave. and the Erie R.R. The general contract has been let to the LACKAWANNA BRIDGE CO. for the steel work.

A four-story and basement addition 60x100 ft. is to be made to the meat products packing plant of the Danahy Packing Co. on Metcalfe St.

The Dobel Mfg. & Plating Co., has been incorporated and will erect and equip a plant for plating and polishing.

Fredonia, N. Y.—The Cudahy Packing Co. will erect a factory at Fredonia, N. Y., 112x192 ft. of steel and concrete construction.

Gloversville, N. Y.—The Normandie Silk Mills, Inc., has been incorporated and will equip mills for the manufacture of silk fabrics. Thos. H. Hubbard, George B. and Clinton V. Rowland, Gloversville, are the incorporators.

Oneonta, N. Y.—A three-story and basement flour mill 80x92 ft., is to be erected by the Elmore Milling Co. Orlo Epps is Arch., Main St., Oneonta.

Port Chester, N. Y.—The Smith-Angevine Co. plans to build a factory on Purdy Ave., for the manufacture of soap and other products, from hides. Estimated cost, $20,000.

Rochester, N. Y.—The New York State Rys. Co., Rochester, N. Y., is having plans prepared for the erection and equipment of a car barn on Charlotte Blvd., in Greece, a suburb of Rochester. The estimated cost is $200,000. D. P. Falconer, Rochester, is Engr.-in-Charge.

Howard B. Nurse, Arch., Cutler Bldg. has completed plans and is taking bids for a 1-story factory, of brick and steel to be erected on Elm St. by the Probst Realty Co. for the Varsity Candy Co., lessee who will install machinery for the manufacture of candy.

Syracuse, N. Y.—Bids are being received for a two-story factory, 78x134 ft., to be erected by A. H. Durston.

Utica, N. Y.—A factory building 54x118 ft. 2 stories for which plans have been completed will be built on Broad St. by J. A. Birsching manufacturer of textile machinery.

✚The West End Brewing Co. has let contracts for a 55x90-ft. addition to its brewing plant. The structural iron work contract has been let to the UTICA STEAM ENGINE & BOILER WORKS.

Camden, N. J.—The Victor Talking Machine Co. Camden, N. J., will erect a large addition.

Elizabeth, N. J.—The Waclark Wire Co. has secured a permit and will erect an addition to its plant, to cost $20,000.

Mount Wolf, Penn.—The American Wire Fabric Co. has completed plans for doubling the capacity of its plant at Mount Wolf. The plans provide for an extension, 200x80 ft., a new tower, 42x36 ft., and a new engine house.

Philadelphia, Penn.—The Central Machine Co. is having plans prepared for the construction of a three-story machine shop at Seventh and Franklin Sts., Peuckert & Wunder are Archs.

A permit has been granted to James Stewart & Co., for the construction of a drier machinery house, at Girard Point, Philadelphia. It will be three stories, 33x62 ft., to cost $60,000.

The General Engineering Co., Philadelphia, Penn., has been granted a permit for the erection of a factory 67x157 ft. at Front & Kenilworth Sts. to cost $13,000.

Pittsburgh, Penn.—The Standard Underground Cable Co., Pittsburgh, Penn., has plans for a factory and office building 50x21 ft.

Baltimore, Md.—The Martin Wagner Co., and the American Can Co., whose plants were recently destroyed by fire, has announced that it will rebuild at once.

Suffolk, Va.—The Parker Buggy Co. has announced plans for the reconstruction of its plant, which was destroyed by fire recently.

Parkersburg, W. Va.—The General Porcelain Co., East Liverpool, Ohio, will erect a new plant, 500x300 ft., at Parkersburg, for the manufacture of electrical porcelain. Cost, $400,000.

Wheeling, W. Va.—The Wheeling Steel Casting Co., Wheeling, has been reorganized and plans to enlarge its plant in North Warwood. Charles H. Dowler is Gen. Mgr.

Charlotte, N. C.—The cotton-yarn mill of George A. Howell, at Charlotte, which was recently destroyed by fire, will be rebuilt. Estimated cost, $30,000.

Gastonia, N. C.—The Cocker Machine & Foundry Co. is being organized at Gastonia, and contemplates the construction of two buildings, each about 40x100 ft. The concern plans to manufacture textile machinery, and conduct a general repair and job foundry business. George B. Cocker is Pres.

Georgetown, S. C.—The Atlantic Coast Lumber Corp. plans to build a concrete and steel mill with a daily capacity of 750,000 ft. of lumber, at Georgetown, to replace that recently burned.

Brunswick, Ga.—The Yaryan Naval Stores Co. plans to build a paper mill at Brunswick, estimated to cost $500,000. M. Perry is mgr.

Birmingham, Ala.—The Steel Cities' Chemical Co. contemplates the construction of an addition to its plant at Birmingham. Estimated cost, $100,000. Culpepper Exum is Pres.

Pansy, Ala.—The Rocky Creek Lumber Co., whose plant was recently destroyed by fire, will rebuild at once at a cost of $50,000.

Beulah, Tenn.—W. W. Bennett, Detroit, Mich., automobile manufacturer, has purchased a site at Beulan, near Nashville, and will establish a new plant.

Knoxville, Tenn.—The Sanford-Day Iron Works are having plans prepared for the construction of a foundry, 66x256 ft., of iron, on a brick foundation.

The Knoxville Tinware Co. contemplates the construction of a plant in the Nobles addition.

The Sanford-Day Iron Works, Knoxvile, is having plans prepared for the erection of a foundry, 66x256 ft., to increase the output of cars.

Memphis, Tenn.—The Yazoo & Mississippi Valley R.R. Co. has had plans prepared for two roundhouses, repair shops, and several changes in its yards at Nonconnah, Memphis.

Memphis, Tenn.—R. J. Darnell, Inc., suffered $100,000 loss in the destruction of its double sawmill and veneer plant by fire. Plans for reconstruction have already been approved.

Louisville, Ky.—The Louisville Gas & Electric Co., which was recently formed, has announced plans for the erection of a garage and stables and blacksmith shop. George H. Harries is Pres.

Paris, Ky.—The Kentucky Distilleries & Warehouse Co., with general offices in Louisville, has announced plans for the enlargement of the Lewis Hunter distillery, near Paris, and will purchase equipment this summer. J. A. Wathen may be addressed at the Louisville office.

Somerset, Ky.—The Cincinnati, New Orleans & Texas Pacific Ry. Co. will erect additions to its railroad shops at Somerset. About $160,000 will be expended.

IND WKS. . . . . .

Cincinnati, Ohio—An eight-story, 44x100-ft. cold-storage plant is being planned and will be erected for the Bender, Striebig & Co., at 218-20 Wright St., Cincinnati.

The Hoffner Bros. Co., tanner, Hopple St. and the Canal, Cincinnati, will build a five-story addition to the plant, 166x80 ft., of brick, mill construction. Phillip Pfeiffer, Arch., will receive bids.

Cleveland, Ohio—The Pfaffman Egg Noodle Co., Cleveland, is having plans prepared for the erection of its proposed factory. It will be three stories, 65x110 ft. The cost has been estimated at $35,000.

Columbus, Ohio—The Columbus Dental Mfg. Co., Columbus, is having plans prepared for the construction of its proposed factory. It will be two stories, and will cost about $15,000.

Columbus, Ohio—A permit has been issued to the Hayden-Corbett Chain Co., Columbus, for the erection of an addition to cost about $10,000.

✚**Lorain, Ohio**—The United States Automatic Co., Lorain, has awarded the contract to KASER BROS., Elyria, Ohio, for the construction of an addition to its plant, at $10,380.

✚**Mount Gilead, Ohio**—The contract has been awarded to the HUGHES-KEENAN CO., Mansfield, Ohio, for the construction of the erecting shop for the Hayden Hydraulic Press Mfg. Co., Mount Gilead.

Niles, Ohio—The Niles Home Baking Co., Niles, is receiving bids for the construction of its proposed bakery, one story, 56x100 ft.

The Deforest Sheet & Tin Plate Co., Niles, will erect several additions to its plant.

Painesville, Ohio—The plant of the Unionville Milling Co., Painesville, owner by J. Morgan, has been destroyed by fire, entailng a loss of $12,000. The main building was 50 ft. high and 30x30 ft., with an addition 18x46 ft. The other building was 30x30 ft. Mr. Morgan contemplates the reconstruction of the plant, with the structure fireproof throughout.

Sidney, Ohio—The Olympic Candy Kitchen, Sidney, will erect a candy factory.

Silica, Ohio—The Toledo-Owens Glass Sand Co., Toledo, Ohio, is planning to erect a plant at Silica to cost $150,000. M. J. Owens is Pres.

Youngstown, Ohio—The Columbiana Rubber Co., Columbiana, has voted to increase its capital stock from $100,000 to $500,000. A large part of the increase will be used for buildings and equipping the plant.

Auburn, Ind.—The Auburn Automobile Co., Auburn, contemplates the erection of a factory, two stories and basement, 60x80 ft.

✚**Indianapolis, Ind.**—The Cole Motor Car Co., Indianapolis, has awarded the contract to the BEDFORD STONE & CONSTRUCTION CO., Bedford, Ind., for the construction of its proposed addition, at $175,000. Noted Feb. 20.

The Independent Envelope Co., Indianapolis, will receive bids soon for the erection of its proposed factory, two stories and basement, 80x160 ft.

Muncie, Ind.—Goodrich Bros. Hay & Grain Co., Muncie, Ind., is having plans prepared for the construction of a grain elevator. The capacity will be 100,000 bu.

Detroit, Mich.—Stahl & Kinsey, Archs., Detroit, have completed plans for the erection of a three-story and basement factory 71x120 ft., for the Bowering Soap Co., on Salliotte Rd., Detroit. W. J. Kengell is Pres.

Chicago, Ill.—M. L. Chapin, Chicago, plans to erect a two-story brick garage, 100x125 ft., at a cost of $25,000.

The Cram-Richtsteig Metal Frame Action Co., Chicago, is receiving bids for the erection of its proposed factory one and two stories, 65x200 ft.

The Chicago Foundry Co., Chicago, is receiving bids for the erection of its proposed foundry; 100x155 ft.

✚**Jackson, Mich.**—The contract has been awarded to the Hauser-Owen-Ames Construction Co., Grand Rapids, Mich., for the construction of the factory for the American Lady Corset Co. Estimated cost, about $70,000.

Appleton, Wis.—Herman J. Schlegel, Appleton, Wis., manufacturer of furnaces and electric washing machinery, will soon let the contract for the erection of a new machine shop and foundry. The plant will also include a pattern shop.

✚**Fond du Lac, Wis.**—The HUTTER CONSTRUCTION CO. has been awarded the general contract for the erection of a two-story brick and concrete glading and painting building for the Moore & Galloway Lumber Co. It will be 36x42 ft. in connection with a mill construction warehouse, 36x250 ft.

Waukesha, Wis.—The International Steel Construction Co., Waukesha, has filed an amendment to its articles of incorporation which increases its capital stock from $10,000 to $50,000.

Amarillo, Tex.—The Rock Island R. R. Co. will make several improvements and will erect car-repair shops at Amarillo, which will cost about $80,000.

Cleburne, Tex.—The Gulf, Colorado & Santa Fé R.R. will make improvements and additions to its shops here at a cost of $123,000. The work will soon be started.

Dallas, Tex.—The Planters Oil Co., Dallas, was recently organized with capital $150,000, and will establish a cotton-seen oil mill.

The owners of the Dundee Woolen Mills will build a six-story and basement addition to their plant.

Mexia, Tex.—John R. Rollins, of St. Louis, Mo., and associates are preparing to construct a plant here for the manufacture of terra cotta. More than $100,000 will be invested in the enterprise, it is stated.

Rosenberg, Tex.—Arrangements are being made to construct a brick and tile factory here at a cost of about $100,000. I. M. Staunton is interested.

Wichita Falls, Tex.—E. C. Holt and associates will soon begin the construction here of a cotton mill that is to cost $500,000.

Mesa, Ariz.—A. H. Parker and associates contemplate erecting four small ore-reduction mills near here. Each mill will be of 25 tons capacity and will cost about $25,000.

Seattle, Wash.—The Ford Motor Co., Detroit, Mich., has completed plans and specifications for the construction of an assembling plant to be erected at Seattle, Wash., at an estimated cost of $400,000.

Los Angeles, Calif.—The San Pedro, Los Angeles & Salt Lake City R.R. Co. is planning to spend about $140,000, on enlarging and improving its repair shops.

Morris & Co., Kansas City, Mo., packers, will erect a three-story and basement building on Sixth St. between Mill and Mateo Sts. It will be either reinforced concrete or steel frame.

✚The Webster Showcase & Fixture Co. has awarded a contract to the F. O. ENGSTROM CO., Fifth and Seaton Sts., Los Angeles, at $20,000, for the construction of a three-story factory at 431 Colyton St. The building will be of brick and concrete, 49x158 ft. John J. Cornwell is Arch.

✚**Martinez, Calif.**—The Associated Oil Co. has awarded a contract to REEVES BROS., of Alliance, Ohio, whereby the capacity of the plant at Avon, now under construction, will be doubled. Four tanks with a capacity of 10,000 barrels each and eight additional stills will be constructed.

Richmond, Calif.—The National Mfg. Co., of San Francisco, will erect a three-story plant building to manufacture brass fitting and ornamental brass work of all kinds.

Montreal, Que.—The Riordan Pulp & Paper Co., Montreal, is having plans prepared for a new mill to be erected in Northern Ontario, having an annual capacity of 30,000 tons.

M. J. Butler, 22 Victoria Square, Montreal, is manager of a new company, which has purchased a mile of waterfront along the St. Lawrence, and is having plans prepared for a new $1,000,000 steel forging plant.

Sorel, Que.—The Sorel Iron Works will soon begin the construction of an addition to its foundry to cost $10,000.

Ottawa, Ont.—Bids will be received by the Brown Lithographing Co. for the erection of a new factory on Wellington St., to cost $20,000. It will be of brick construction, with a concrete foundation.

Peterborough, Ont.—Plans are being prepared for the new Canadian factory of the Vermont Marble Co., Proctor, Vt. The building will be one story, 64x212 ft., wood construction, concrete foundation, felt and gravel roof. It will cost $20,000.

Stratford, Ont.—Farquharson & Gifford, manufacturers of upholsterers' supplies, have had plans prepared for a new factory to cost $15,000. J. S. Russell, 21 Downie St., is Arch.

Davidson, Sask.—The Heathfield, Hammond & Thomas Co. plans to erect a new brick-making plant. New equipment will be required.

EXAMINATION

Laboratory Aid and Engineer—Washington, D. C.—The United States Civil Service Commission announces an examination for laboratory aid and engineer, for men only, on July 2. From the register of eligibles resulting from this examination, certification will be made to fill a vacancy at a salary ranging from $800 to $900 a year, in the forest products laboratory at Madison, Wis., and vacancies as they may occur in positions requiring similar qualifications. The duties of laboratory aid and engineer consist, in general, of the operation and care of the mechanical appliances used in the laboratories. Applicants for this examination should be of good physique, as they may be required to handle heavy timbers and to do general work in pipe fitting and setting up and modification of machinery. Competitors will be examined in the following subjects, which will have the relative weights indicated: 1. Arithmetic (simple tests in addition, subtraction, multiplication, and division of whole numbers and United States money), 10; 2. Operation and care of boilers, motors, shafting, etc. (including a general knowledge of the processes involved in the manufacture of wood pulp) 30; 3. Training, experience, and fitness, 60. Practical experience and familiarity with the use and care of machinery and tools, such as steam boilers, pumps, saws, electric motors, etc., is prerequisite for consideration for this position. Persons who meet the requirements and desire this examination should at once apply to the United States Civil Service Commission, Washington, D. C., for application and examination Form 1312.

Mechanician and Laboratory Assistant—Washington, D. C.—The United States Civil Service Commission announces an examination for mechanician and laboratory assistant, for men only, on July 2 and 3. From the register of eligibles resulting from this examination certification will be made to fill a vacancy at a salary ranging from $1000 to $1400 a year, in the Bureau of Mines, San Francisco, Calif., and vacancies as they may occur in positions requiring similar qualifications. The duties of the person appointed to this position will consist in the design construction and repair of scientific instruments and apparatus used in the chemical, physical, and metallurgical laboratories of the bureau, together with assistance in the work of investigation and testing in these laboratories and in the field work. Two days will be required for this examination. Competitors will be examined in the following subjects, which will have the relative weights indicated: 1. Practical questions, 30; 2. General physics and chemistry, 20; 3. Mechanical drawing, 20; 4. Education, training, experience, and fitness, $30. Applicants should have had training in physics, general analytical and physical chemist[ry] and mechanical drawing, together with adequate actual [ex]perience in the making and repair of instruments of precis[ion]. A knowledge of glass blowing is an advantage, but is not [in]sisted on at the outset. Persons who meet the requireme[nts] and desire this examination should at once apply to [the] United States Civil Service Commission, Washington, D. [C.] for application and examination Form 1312. Applicants m[ust] have reached their 21st but not their 40th birthday on [the] date of the examination.

INDUSTRIAL NOTE

The Riter-Conley Mfg. Co., Pittsburgh, Penn., has receiv[ed] a rush order for 1600 ft. of 10-in. pipe, ranging from o[ne-]quarter to five-eighths inch in thickness, for a new siph[on] for the Los Angeles Aqueduct.

The Firm of C. G. Young, Bankers Trust Bldg., New Yo[rk] has been engaged to make examinations and reports on ce[r-]tain important Public Utilities in Central America. H. [C.] Beldon, one of the firm's engineers, who will make the loc[al] studies, sailed from New York on May 17 and will probably be away for some time. This firm has had a wide experience in all Latin American countries as well as other parts of the world.

The Laclede Steel Co., St. Louis, Mo., manufacturer of rail carbon-steel bars for reinforcing work, also angles and agricultural shapes, announce the appointment of Theodore Geissmann & Co., Inc., 72 West Adams St., Chicago, Ill., as its authorized district sales agent in the Central West, for the distribution of its products.

The Dunn Wire Cut-Lug Brick Co. reports that in 1912 the total number of square yards of paving brick laid by manufacturers of wire cut-lug brick, who are licensed under the company's patents, and who are also members of the National Paving Brick Manufacturers Association, was equal to 53% of the total yardage of paving brick produced by all the manufacturers in the National Association. The company has also licensed several manufacturers of paving brick who are not members of the National Association.

Profits Derived by the city of Pasadena, Calif., from the operation of the municipal lighting plant from Mar. 29, 1912, to Mar. 29, 1913, totalled $63,365, according to a report made by expert accountants employed to audit the books. According to the report the profits shown are after bond interest and other charges, totaling $95,679, had been paid. The value of the plant is fixed at $580,745.

The Manufacturer's Supply Co., 2317 University Ave., S. E., has purchased from the Stone & Webster Engineering Corporation, its entire plant used on the $30,000,000 hydro-electric development for the Mississippi River Power Co., at Keokuk, Iowa. The equipment consists of everything in construction equipment and machinery, used in connection with this work. This company has shipped up to date from the work to the plant in Minneapolis, over one hundred carloads of the equipment, and the balance, about the same number of cars, will be released, and come forward to their plant after July 15, the date set for the operation of the power house and dam.

The Maryland Steel Co., Sparrows Point, Md., has awarded a contract to the Raymond Concrete Pile Co., New York and Chicago, for the design and construction of reinforced concrete stock bins for blast furnace "C" at its Sparrows Point plant.

The Colombian Ministry of Public Works has been authorized to proceed with the construction of a section of railway designed to connect the Southern Ry. with the Salto de Tequendama Ry. The line will be bidived into three sections, the Tequendama Station to the river Muña, thence to El "Charquito," and from the latter point to Salto de Tequendama.

The Rockwell Furnace Co.—The good will, drawings, patterns, patents, etc., of the Rockwell Furnace Co., New York, N. Y., have been purchased by the Quigley Furnace & Foundry Co., Springfield, Mass. The latter will continue the manufacture of the full line of Rockwell furnaces with the exception of the melting furnaces, portable heaters, rivet forges, etc., which will be built by the Monarch Engineering & Mfg. Co., Baltimore.

Statistics of the Iron Trade—The Bureau of Statistics of the American Iron and Steel Institute has received from the manufacturers statictics of the production of all kinds of steel ingots and castings in the United States in 1912.

The production of Bessemer steel ingots and castings in 1912 was 10,327,901 tons, against 7,947,854 tons in 1911, an increase of 2,380,047 tons, or over 29.9%. The production in 1912 was 1,947,929 tons less than in 1906, when the maximum production of 12,275,830 tons was reached. The year of next largest output was 1907. Of the total production in 1912 10,260,913 tons were made by the standard Bessemer process, 33,555 tons by the Tropenas process, and 33,433 tons by other modifications of the standard Bessemer process.

The total production of open-hearth steel ingots and direct castings in 1912 amounted to 20,780,723 tons, against 15,598,650 tons in 1911, an increase of 5,182,073 tons, or over 33.2%. In 1908 the production of open-hearth steel for the first time exceeded the production of Bessemer steel, the excess amounting to 1,719,974 tons. In 1912 the output of open-hearth steel exceeded the output of Bessemer steel by 10,452,822 tons, or over 101.2%. Of the total production of open-hearth steel in 1912 19,909,875 tons were ingots and 870,848 tons were castings, against 15,027,459 tons of ingots and 571,191 tons of castings in 1911.

It is estimated that about 573,883 tons of open-hearth stee[l] ingots and direct castings which were treated with ferro-vanadium, ferro-titanium, ferro-chrome, nickel, or other alloys are included in the total for 1912, as compared with about 296,065 tons in 1911. Of the total in 1912 about 493,195 tons were ingots and about 80,685 tons were castings, while in 1911 about 255,333 tons were ingots and about 40,732 tons were castings.

In 1912 there were 19,641,502 tons of open-hearth steel made by the basic process and 1,139,221 tons by the acid

process, while in 1911 the production by the basic process amounted to 14,685,932 tons and by the acid process to 912,718 tons.

Included in the 19,641,502 tons of basic open-hearth steel ingots and castings produced in 1912 are 1,438,654 tons of duplex steel ingots and castings which were made from metal partly purified in Bessemer converters and finally purified in basic open-hearth steel furnaces. This steel was produced by seven works in four states as follows: Pennsylvania, four; Maryland, one; Alabama, one, and Illinois, one. Similar statistics for 1911 were not collected by the American Iron and Steel Association. No acid open-hearth steel was produced by the duplex process in 1912.

The production of crucible steel in 1912 amounted to 121,517 tons, against 97,653 tons in 1911, an increase of 23,864 tons, or over 24.4 per cent. The maximum production was reached in 1907, when 131,234 tons were made.

The production of steel by the electric process in 1912 amounted to 18,309 tons, as compared with 29,105 tons in 1911, a decrease of 10,796 tons. In 1910 the output was 52,141 tons, in 1909 it was 13,672 tons, and in 1908 it was 55 tons. In the latter year the production was included with that of open-hearth steel.

The production of all kinds of steel ingots and castings in 1912 amounted to 31,251,303 tons, against 23,676,106 tons in 1911, an increase of 7,575,197 tons, or almost 32%. The production of 1912 was much the largest in the country's history.

The total production of all kind of steel ingots in 1912, not including steel castings, amounted to 30,284,682 tons, against 23,029,479 tons in 1911, an increase of 7,255,203 tons, or over 31.5%. The production in 1912 was the largest in our history. The year of next largest production was 1910, when 25,154,087 tons were made.

Idle Railway Cars—A steady but gradual increase has been reported in the number of idle railway cars since the last report was printed in this paper. The number of idle cars now, however, is less than that at the corresponding date last year and also in 1911.

The following table has been computed from the figures of the American Railway Association:

1913	Surplus	Surplus	Net surplus
June 14	71,126	7,199	63,927
May 31	60,291	9,383	50,908
May 15	61,269	10,975	50,294
May 1	53,977	14,178	30,799
Apr. 15	70,715	13,217	57,498
Apr. 1	68,792	10,804	57,988
Mar. 15	57,998	20,223	37,775
Mar. 1	58,529	27,148	31,381
Feb. 15	52,700	30,517	22,183
Feb. 1	62,045	24,785	37,260
Jan. 15	53,230	24,791	28,439
1912			
Dec. 31	50,659	33,601	17,058
Dec. 14	26,614	61,006	*34,392
Nov. 30	26,135	62,536	*36,401
Nov. 21	22,363	73,475	*51,112
Nov. 7	19,987	71,156	*51,169
Oct. 24	17,289	57,270	*49,981
Oct. 10	22,810	34,389	*31,579
Sept. 26	26,754	44,547	*17,793
Sept. 12	27,380	36,000	*8,620
Aug. 29	36,047	26,279	9,750
Aug. 15	58,623	14,722	43,901
Aug. 1	65,904	9,395	56,510
July 18	75,389	6,467	68,922
July 4	70,731	6,707	64,024
June 20	73,464	5,746	67,718
June 6	89,208	2,822	86,386
May 22	123,683	7,482	116,201
May 9	136,776	6,678	130,098
Apr. 25	151,186	12,305	138,881
Apr. 11	94,943	15,554	79,389
Mar. 27	52,680	33,974	18,704
Mar. 13	46,028	42,985	3,043
Feb. 28	44,984	37,142	7,842
Feb. 14	50,886	36,928	13,953
Jan. 31	55,592	23,011	32,581
Jan. 17	102,479	12,194	90,258
Jan. 2	.....	.....	135,938

French Railway Operation—The working of the State railways, which include the old system of 1879, and the Ouest Ry. bought four years ago, is very expensive. The reporter of the Senate, though he tries to appear optimistic, has to admit that the increase of expenses has for the three years been continuous, both for the old and the new lines. He states that the financial results can only appear deceptive. He wishes to point out that the expenses in which the railway administration have been involved have been necessitated by the condition in which the old Ouest company left its line. But it has been shown, notably by M. Colson, a State Councilor, that the system, before being purchased, was minutely inspected by the Government engineers, and that it was out of the question that they should have allowed the company to neglect its upkeep. On Jan. 1, 1909, the State took possession of the line. In 1908, a year in which the expenditure was swelled by the costs of liquidation, the working receipts exceeded $219,500,000, while expenses were rather under $148,000,000, leaving a net profit of $71,000,000. During 1912 the receipts reached nearly $242,000,000, a figure which is certainly satisfactory; but working expenses rose to nearly $220,000,000, leaving a net profit of $22,000,000. Thus in four years of State working receipts have increased 10%, expenses 50%, and the net profit has declined 68%. During the same period the ratio of expenses has grown from 67% to 91%. Further, on the ld State system, where a company cannot be accused of having allowed the line to get into a bad condition, affairs have been much the same.

The Public Service Commission for the First District has come to an agreement with the Long Island R.R. Co. in regard to the easement rights for the St. Felix St. branch of the Fourth Ave. Subway, which passes under the Long Island R.R. station in Brooklyn. The Long Island Co. has withheld its consent to the construction of this subway pending this agreement. It has been agreed that the city will pay the railroad company $200,000 for the right to build the subway under the station, and that the patrons of the subway shall have free use of the stairways, etc., in the railroad station. All that remains to be done now to legalize this route is to get the consent of the Brooklyn Academy of Music. This branch leaves the Fourth Ave. Subway at Fulton St. and runs through St. Felix St. and Flatbush Ave. to a connection with the Brighton Beach Elevated R.R., at Malbone St. When completed it will be operated by the New York Municipal Ry. Corporation in accordance with the provisions of the dual-system contract. The agreement was reached in a conference, participated in by members of the Public Service Commission and officers of the Long Island R.R., and the New York Municipal Ry. Corporation. George McAneny, Boro. Pres., representing the Board of Estimate and Apportionment, also participated in the conference. The proposal to use the right of way of the Evergreen Branch of the Long Island R.R. instead of Wyckoff Ave. for the Eastern District elevated railroad was discussed, but no agreement was reached. This matter will be the subject of further conferences. The Commission for the First District will hold a hearing June 26 at 2:30 p.m., on the application of the New York Municipal Ry. Corporation for permission to issue $400,000 of its capital stock. The companw last January applied for permission to issue $1,000,000 in capital stock, and the Commission at that time authorized an issue of $100,000. The company now asks to issue $40,000 of the remaining $900,000 of such stock, for the purpose of providing working capital for the performance of the company's obligations under the dual-system subway contract.

William C. Jones, Ltd., Manchester, England, and 200 Summer St., Boston, Mass., announces the erection, in Boston, of a plant to demonstrate its patented method of manufacturing wiping-waste in rope form. The makers claim that the large capacity of the machine and the superior economy and convenience of the "Boa Waste" have been appreciated and taken advantage of, in Europe, for some time.

Value of Scrap—Junk dealers, during 1912, did an enormous business, the Geological Survey asserts in a statement issued this week. The value of "secondary metals," exclusive of gold, silver, platinum, iron and aluminum, recovered last year was $77,395,843, as compared with $52,585,390 in 1911, an increase of more than $25,000,000.

The survey's report does not set forth the quantity of old iron and steel remelted, neither does it include the precious metals. The quantity of aluminum scrap returned to the secondary smelters is increasing rapidly, says the survey, owing to the rise of the automobile, and it adds that the report next year probably will include "secondary aluminum."

The total amount of secondary copper recovered was 137,507 tons, assuming that the brass remelted had an average copper content of 70 per cent.; secondary lead recovered amounted to 67,168 tons; recovery of secondary zinc amounted to 81,543 tons; and secondary tin recoveries reached 15,401 tons. The quantity recovered as tin was 8333 tons and that in alloys and chemical compounds 7068 tons.

Civil Engineer Student—The U. S. Civil Service Commission announces an open competitive examination for civil-engineer student, for men only, on Aug. 6. From the register of eligibles resulting from this examination certification will be made to fill vacancies as they may occur in this position in the Office of Public Roads, Department of Agriculture, at a salary of $720 per annum, and vacancies as they may occur in positions requiring similar qualifications. An appointment as a result of this examination, and satisfactory service in the position, will afford young engineers an excellent opportunity to acquire experience in highway engineering. A part of the time will be devoted to laboratory and office work and the remainder to practical road building in different parts of the United States. The appointee is thus enabled to become familiar with thesephases of the work. As this work involves considerable travel throughout the United States, all traveling expenses, and subsistence not to exceed 30 days on any one assignment, will be paid by the department.

As insufficient eligibles were secured from the examination for this position held on Apr. 9, 1913, qualified persons are urged to enter this examination.

Competitors will be examined in the following subjects, which will have the relative weights indicated:

Mathematics and mechanics, pure and applied, 50 points; surveying, construction and material of construction, 50 points.

An educational training equivalent to that required for graduation in civil engineering from a recognized school or college is a prerequisite for consideration for this position.

CATALOG NOTICES

The Brown Hoisting Machinery Co., Cleveland, Ohio. Catalog I. Brownhoist locomotive cranes. Illustrated, 72 pages, 6x9 inches.

Edgar Allen American Manganese Steel Co., McCormick Building, Chicago, Ill. Bulletin No. 61. "Stag" brand manganese steel castings for rolling mills and blast furnaces. Illustrated, 28 pages, 6x9 inches.

United States Blue Print Paper Co., 319-21 S. La Salle St., Chicago, Ill. Catalog. Drawing materials and surveying instruments. Illustrated, 400 pages, 4x6 inches.

Sprague Electric Works, 527-31 W. 34th St., New York. Catalog No. 521. Flexible steel-armored hose. Illustrated, 16 pages, 5½x7½ inches.

The Goulds Mfg. Co., Seneca Falls, N. Y. Pamphlet. Irrigation pumps. Illustrated, 32 pages, 6¼x8 inches.

De Laval Steam Turbine Co., Trenton, N. J. Catalog C. Steam turbines, velocity-stage type. Illustrated, 108 pages, 6x9 inches.

Baldwin Locomotive Works, Philadelphia, Penn. Record No. 73. Recent Development of the Locomotive. Illustrated, 54 pages, 6x9 inches. Record No. 74. Gasoline locomotives. Illustrated, 24 pages, 6x9 inches.

CONTRACT PRICES

Harbor Improvement—Sheboygan, Wis.—Bids for building reinforced-concrete caisson breakwater and pile pier, removing old pier, and dredging at Sheboygan, were opened June 16, by Lt.-Col. George A. Zinn, Corps Engrs., Milwaukee. The bids were: (A) Robert Love & Co., Muskegon, [illegible]; (B) Greiling Bros. Co., Green Bay, Wis.; (C) Wisconsin Dredging Co., Muskegon, Mich; (E) Edward Eugene Gillen Dredging Co., Muskegon, Mich.; (E) Edward Eugene Gillen, Racine, Wis.; (F) Great Lakes Dredge & Dock Co., Chicago, Ill.:

HARBOR IMPROVEMENT, SHELBOYGAN, WIS.

	A	B	C	D	E	F
2947 cu.yd. concrete superstructure on caissons	$7.75	$7.50	$8.00	$6.50	$8.50	[illegible]
1211 cu.yd. concrete superstructure on pile pier	7.75	8.50	11.00	6.50	8.75	[illegible]
3579 cu.yd. concrete filling in caissons	7.75	5.75	6.00	6.50	7.75	[illegible]
74 cu.yd. concrete slab walk	7.75	12.00	11.00	6.50	8.50	[illegible]
1135 foundation piles	16.80	17.50	16.50	15.00	19.90	[illegible]
14,000 lin.ft. furnishing and driving round piles in pile pier	0.35	0.34	0.40	0.33	0.37	[illegible]
1680 lin.ft. driving round piles in pile pier, piles furnished by U. S.	0.20	0.25	0.20	0.20	0.23	[illegible]
393.12 M. ft. B.M. making and driving sheet piles, timber furnished by U. S.	20.00	18.00	20.00	17.00	19.00	[illegible]
131.312 M. ft. B.M. framing timber furnished by U. S.	20.00	20.00	25.00	20.00	21.50	[illegible]
14,275 lb. wrought iron or steel drift bolts and wrought iron or wire spikes	0.04	0.05	0.05	0.05	0.05	[illegible]
31,453 lb. wrought iron or steel screw bolts and tie-rods	0.04	0.05	0.05	0.05	0.05	[illegible]
32,914 tons stone	1.65	1.45	1.50	1.55	1.70	[illegible]
1700 lin.ft. removing old pier	35.00	10.50	19.00	20.00	18.50	[illegible]
50,000 cu.yd. dredging	0.25	0.13	0.18	0.16	0.19	[illegible]
Totals	$223,465	$162,970	$187,951	$177,365	$201,648	$204,554

Sewers—Saline, Mich.—Bids for constructing sewers in various streets, according to plans prepared by the W. J. Sherman Co., Toledo, Ohio, were received, June 11, as follows: (A) Emanuel L. Schneider, Ann Arbor, Mich.; (B) Edwards & Whaley, Milan, Mich.; (C) Vanderweek Bros., Grand Rapids, Mich.; (D) Weage & Tyler, Coldwater, Mich.:

SEWERS, SALINE, MICH.

	A	B	C	D
6-in. sewer pipe laid	$0.21	$0.15	.....	.....
16,810 lin.ft. 8-in. sewer pipe laid	0.21	0.20	0.18	0.26
3590 lin.ft. 10-in. sewer pipe laid	0.30	0.29	0.27	0.37
1970 lin.ft. 12-in. sewer pipe laid	0.49	0.32	0.35	0.47
15-in. sewer pipe laid	0.74	0.45	.....	.....
4290 lin.ft. trenching under 6 ft.	0.38	0.29	0.27	0.27
9520 lin.ft. trenching 6 to 8 ft.	0.43	0.41	0.37	0.35
6810 lin.ft. trenching 8 to 10 ft.	0.60	0.57	0.57	0.51
1670 lin.ft. trenching 10 to 12 ft.	0.70	0.74	0.75	0.65
10 lin.ft. trenching 12 to 14 ft.	1.20	1.05	1.00	0.80
30 lin.ft. trenching 14 to 16 ft.	1.20	1.70	1.50	1.10
100 lin.ft. 4-in. farm tile laid	0.10	0.14	0.45	0.15
100 lin.ft. 6-in. farm tile laid	0.15	0.18	0.50	0.18
49 manholes	36.00	40.00	40.00	35.00
3 drop manholes	42.00	49.00	45.00	40.00
2 flush tanks	75.00	63.50	55.00	70.00
1.28 tons c.i. pipe	38.00	—50.00	30.00	30.00
100 lb. c.i. pipe specials	0.06	0.18	0.55	—
60 lin.ft. laying 8-in. c.i. pipe	1.50	....	0.75	0.70
100 lin.ft. galvanized pipe connections	0.15	0.20	0.50	0.32
50 sq.yd. repaving brick	1.50	1.05	0.60	0.75
20 cu.yd. concrete	8.00	6.00	5.00	10.00
10 cu.yd. extra excavation	2.00	0.30	1.00	0.50
50 cu.yd. rock excavation	6.50	3.00	3.00	2.00
1 M. ft. b.m. new sheeting	40.00	18.00	28.00	25.00
1 M. ft. b.m. old sheeting	25.00	12.00	28.00	15.00
10 cu.yd. extra concrete	8.00	6.00	5.00	10.00
10 cu.yd. extra gravel	2.50	1.50	1.50	3.00
10 cu.yd. extra broken stone	3.00	1.50	2.00	3.00
100 hours common labor	0.30	0.275	0.29	0.30
25 hours team labor	0.75	0.55	0.59	0.60
Totals	$19,552	$18,214	$17,517	$18,434

★★Telephone System—New York, N. Y.—Bids for constructing a portion of the telephone system for the Catskill Aqueduct, Contract 93, were received by the Board of Water Supply, June 10, as follows: (A) NEW YORK TELEPHONE CO., 15 Dey St., New York (awarded contract); (B) Carpenter & Lindsay, Paterson, N. J.; (C) Lord Electric Co., 105 West 40th St., New York; (D) Watson-Flagg Engineering Co., 27 Thames St., New York; (E) Young & Hyde, Inc., Produce Exchange Bldg., New York; (F) Perry J. Fitzgerald, 48 Howard St., Albany, N. Y.; (G) Henry E. Fox Construction Co., 81 East 125th St., New York; (H) W. L. Bull, Jr., Inc., 135 Front St., New York; (I) Average:

CATSKILL AQUEDUCT TELEPHONE SYSTEM, NEW YORK

	A	B	C	D	E	F	G	H	I
1575 30-ft. wooden poles	$10.00	$7.75	$9.84	$9.98	$7.50	$11.00	$11.228	$14.00	$10.16
14 35-ft. wooden poles	12.00	10.75	11.70	13.00	8.50	14.00	14.014	15.00	12.37
21 40-ft. wooden poles	14.00	14.75	15.00	16.36	9.50	19.00	18.256	16.00	15.36
120 setting wooden poles in rock at additional price	5.00	7.25	14.50	34.10	3.00	8.00	17.71	15.00	13.07
63 steel poles	51.65	70.00	65.75	57.33	80.00	120.00	59.83	45.00	68.69
13 setting steel poles in rock at additional price	4.45	10.00	6.60	24.94	13.00	10.00	28.83	25.00	15.35
25 replacing existing wooden poles	12.75	10.00	14.50	9.98	8.00	15.00	16.87	15.00	12.76
50 moving existing wooden poles	11.00	6.00	8.00	5.37	2.50	10.00	11.24	5.00	7.39
125 wire guys	6.90	8.25	7.00	6.50	4.00	5.00	7.70	10.00	6.92
450 6-pin cross-arms	1.38	2.35	2.50	1.72	2.20	1.50	2.54	1.25	1.93
1150 8-pin cross-arms	1.58	2.53	3.00	1.98	2.50	1.80	2.97	1.55	2.24
550 10-pin cross-arms	1.76	2.90	3.50	2.38	3.00	2.00	3.43	1.87	2.60
4950 insulators	0.026	0.0325	0.12	0.06	0.05	0.03	0.0863	0.04	0.056
575 brackets in aqueduct tunnels	5.26	10.00	8.50	6.50	7.00	10.00	8.55	4.60	7.55
5 aqueduct tunnel cable entrances	79.75	137.00	132.00	150.00	300.00	100.00	137.34	400.00	179.51
Cable entrance to tunnel at Breakneck Uptake chamber, lump sum	107.45	235.00	160.00	200.00	700.00	250.00	261.00	1300.00	401.68
35,000 lb. bare copper wire	0.2[illegible]	0.225	0.21	0.26	0.24	0.22	0.319	0.50	0.275
Hudson River crossing, lump sum	2,528.[illegible]	2,414.00	3,900.00	3,616.00	7,500.00	9,000.00	6,610.00	5,600.00	5,271.07
2 station instrument sets, set	80.89	100.00	163.00	158.00	300.00	60.00	162.19	150.00	146.76
4 jack station sets, set	69.00	190.00	102.00	150.00	100.00	40.00	178.19	85.00	114.27
Private branch exchange switchboard and appurtenances, lump sum	287.62	275.00	340.00	350.00	450.00	250.00	342.61	390.00	335.65
5 underground railroad crossings	162.65	225.00	196.00	285.00	300.00	100.00	361.34	600.00	278.75
500 transpositions	0.70	0.65	1.80	1.00	1.00	1.00	4.76	5.00	1.99
Clearing and trimming of trees, lump sum	230.00	525.00	792.00	2,250.00	4,000.00	1,750.00	2,100.00	2,500.00	1,768.37
Totals	$41,617	$46,549	$51,379	$53,104	$53,862	$58,543	$64,656	$71,077	.....

Dam—Seattle, Wash.—Bids were received by the Board of Public Works, June 13, for constructnig a concrete gravity dam at Cedar Lake. The dam will be 200 ft. high, 800 ft. long, 15 ft. wide at top, and 20 ft. wide at bottom. The contract also includes the construction of a 1500-ft. tunnel, 11 ft. in diameter. A. H. Dimock is City Engr. The bids were: (A) Hans Pederson, Alaska Bldg., Seattle; (B) Nettle-Bruce-Eschbach Co.; (C) P. E. McHugh, Tacoma, Wash.; (D) Graff Construction Co., Seattle:

CEDAR RIVER DAM, SEATTLE, WASH.

	A	B	C	D
108,000 cu.yd. cyclopean masonry concrete 1 to 7 in.	$5.25	$3.30	$5.40	$3.56
3500 cu.yd. back of dam concrete 1 to 6 in.	6.50	4.92	6.25	5.18
2200 cu.yd. tunnel lining concrete 1 to 6 in.	10.00	8.90	14.00	12.50
1600 cu.yd. valve wells concrete 1 to 8 in.	8.00	6.90	10.00	9.65
450 cu.yd. penstock valve pit	7.50	6.14	14.00	6.00
26,000 cu.yd. earth excavation	0.35	0.18	0.40	0.50
120,000 cu.yd. rock excavation	1.10	1.02	1.25	1.52
1550 lin.ft. tunnel excavation	14.75	21.60	30.00	15.00
32,000 lin.ft. drilling grout holes	0.75	1.68	1.50	1.50
2000 bbl. portland cement for grouting	2.50	2.52	2.30	2.40
320 cu.yd. grout	6.00	20.10	8.00	5.40
12,000 lin.ft. 4-in. grouting pipes	0.37	0.12	0.50	0.37
300 lin.ft. 2-in. galvanized steel pipe in tunnel lining	0.26	0.12	0.30	0.20
1000 lb. copper strips in contraction joints	0.45	0.60	0.35	0.40
1 venturi meter	3446.00	4800.00	4250.00	5500.00
6 sluice valves	750.00	960.00	485.00	764.00
3 60-in. gate valves	4100.00	5040.00	4165.00	6710.00
1 24-in. gate valves on bypass	250.00	360.00	325.00	300.00
3 floor stands for 12-in. bypass	10.00	90.00	35.00	50.00
3 sets sheaves for counterweights for 60-in. valves	16.00	150.00	10.00	30.00
183 lin.ft. 78-in. steel pipe	30.00	36.00	30.00	35.00
28,600 lb. 24-in. c.i. flanged pipe	0.09	0.12	0.10	0.04
4500 lb. c.i. counterweights	0.04	0.06	0.06	0.04
27 lin.ft. 2½-in. valve stems for 24-in. gate valve	2.00	6.00	4.00	3.00
265 lin.ft. 5-in. valve stems for sluice valves	9.00	10.80	9.00	8.00
1 penstock valve house	800.00	960.00	1000.00	1400.00
6 screens	150.00	240.00	110.00	110.00
1750 lin.ft. phosphor bronze cord	0.10	0.30	0.25	0.25
1 steel gate	70.00	120.00	70.00	100.00
100,000 lb. special castings	0.05	0.072	0.06	0.07
Removal of flume and pipe line, lump sum	600.00	1920.00	10,000	2250.00
Totals	$866,578	$689,110	$976,071	$798,882

Channel—Chicago, Ill.—Bids for constructing Sections 7 and 8 of the Calumet Sag Channel, were received by the Sanitary District of Chicago, June 19, as follows: (A) Green & Sons Co., Chicago; (B) Byrne Bros. Dredging & Engineering Co.; (C) Great Lakes Dredge & Dock Co.; (D) T. W. Keys:

CALUMET SAG CHANNEL, CHICAGO, ILL.

	A	B	C	D
Section 7				
1,150,000 cu.yd. glacial drift excavation	.....	$0.4375	.....	$0.62
10,000 cu.yd. solid rock excavation	.....	0.90	.....	3.00
1800 lin.ft. roadway construction	.....	2.50	.....	3.00
650 cu.yd. concrete	.....	7.50	.....	12.00
10,000 lb. reinforcing metal	.....	0.065	.....	0.045
Erecting Worth Road Bridge, lump sum	.....	7000.00	.....	9500.00
Totals, Section 7	.....	$529,150	.....	$766,150
Section 8				
1,200,000 cu.yd. glacial drift excavation	.....	0.439	.....	0.62
5000 cu.yd. solid rock excavation	.....	0.90	.....	3.00
1295 lin.ft. roadway construction	.....	2.50	.....	3.00
550 cu.yd. concrete	.....	7.50	.....	12.00
9000 lb. reinforcing metal	.....	0.065	.....	0.045
Erecting Pipes Road Bridge, lump sum	.....	11,000.00	.....	11,500.00
Totals, Section 8	.....	$550,198	.....	$781,330
Sections 7 and 8				
12,350,000 cu.yd. glacial drift excavation	0.425	0.435	0.515	0.62
15,000 cu.yd. solid rock excavation	1.90	0.90	2.80	3.00
3075 lin.ft. roadway construction	2.25	2.50	2.75	3.00
1200 cu.yd. concrete	10.00	7.50	14.00	12.00
19,000 lb. reinforcing metal	0.06	0.065	0.055	0.045
Erecting Worth Road Bridge, lump sum	7230.00	7000.00	7500.00	9500.00
Erecting Pipes Road Bridge, lump sum	10,500.00	11,000.00	10,500.00	11,500.00
Totals, Sections 7 and 8	$1,065,039	$1,071,673	$1,296,551	$1,547,480

Paving—Painesville, Ohio—Bids for paving Erie and State Sts. were received by the city, May 24. The bids were: (A) E. A. FRESHWATER & SONS, Chester, W. Va. (awarded both contracts at following bids: Erie St., using Bessemer Block with grout filler and concrete curb and gutter, $14,301; State St., using Metropolitan Block, with grout filler and stone curb, $31,705); (B) Ohio Engineering Co.; (C) Gould & Maybach; (D) Midland Construction Co., 10 South La Salle St., Chicago; (E) R. Deckard & Son:

PAVING ERIE ST., PAINESVILLE, OHIO.

	A	B	C	D	E
2260 cu.yd. grading	$0.40	$0.45	$0.50	$0.40	$0.40
8657 sq.yd. Bessemer block	1.20	1.25	1.34	1.54	1.48
8657 sq.yd. Metropolitan block	1.23	1.28	1.36	1.56	1.50
8657 sq.yd. Medal block	1.23	1.20	1.20	1.42	1.40
8657 sq.yd. Bula block	....	1.28	1.36	....	1.50
8657 sq.yd. Newburg block	....	....	1.20	....	....
4937 lin.ft. stone curb	0.51	0.52	0.50	0.52	0.48
4937 lin.ft. concrete curb and gutter	0.50	0.55	0.50	0.50	0.45
8657 sq.yd. additional for asphalt filler	0.24	0.15	0.60	0.19	....
8657 sq.yd. additional for tar filler	0.09	0.10	0.55	0.16	....
52 lin.ft. headers	0.50	0.40	0.30	0.40	0.30
10 inlet basins removed or rebuilt	10.00	15.00	15.00	15.00	3.00
50 ft. 10-in. inlet basin pipe	0.50	0.60	0.50	0.48	0.60
2 new manhole caps	10.00	12.00	12.00	15.00	10.00
9 manhole covers reset	2.00	2.00	2.00	4.00	3.00
1 F.H. cap reset	2.00	2.00	2.00	5.00	2.00
670 lin.ft. 6-in. house sewer	0.40	0.50	1.00	0.55	0.40
300 sq.ft. new side wall approach	0.12	0.10	0.13	0.10	0.10
300 sq.ft. old side wall relaid	0.07	0.05	0.05	0.10	0.05

PAVING STATE STREET, PAINESVILLE, OHIO.

	A	B	C	D
6200 cu.yd. grading	$0.40	$0.45	$0.50	$0.40
12,600 sq.yd. foundation	0.60	0.55	0.72	0.50
12,600 sq.yd. Bessemer block	1.12	1.25	1.42	1.47
12,600 sq.yd. Metropolitan block	1.15	1.28	1.44	1.49
12,600 sq.yd. Medal block	1.15	1.20	1.28	1.35
12,600 sq.yd. Bula block	....	1.28	....	....
12,600 sq.yd. Newburg block	....	....	1.28	....
7610 lin.ft. stone curb set in concrete	0.61	0.65	0.75	0.59
7610 lin.ft. concrete curb and gutter	0.50	0.55	0.75	0.50
12,600 sq.yd. additional for asphalt filler	0.24	0.15	0.60	0.19
12,600 sq.yd. additional for tar filler	0.09	0.10	0.55	0.16
300 lin.ft. headers	0.50	0.40	0.30	0.40
4 inlet basin covers, reset	2.00	4.00	2.00	3.50
280 lin.ft. 8-in. pipe sewer	1.00	0.75	1.00	1.25
270 lin.ft. 12-in. pipe sewer	0.70	0.70	0.65	0.50
250 lin.ft. 18-in. pipe sewer	1.30	1.50	1.00	0.90
180 lin.ft. 10-in. inlet basin pipe	0.50	0.60	0.50	0.50
6 inlet basins	16.00	20.00	15.00	25.00
4 new manhole caps and covers	10.00	12.00	12.00	15.00
20 manhole covers reset	2.00	2.00	2.00	4.00
4 new F. H. caps	10.00	6.00	5.00	5.00
7 F. H. caps reset	2.00	2.00	2.00	2.00
700 lin.ft. 6-in. house sewers	0.40	0.50	1.00	0.55
300 sq.ft. new side wall approach	0.12	0.10	0.13	0.10
1000 sq.ft. old side wall relaid	0.07	0.05	0.05	0.10
5000 lin.ft. 3-in. tile under drains	0.06	0.05	0.10	0.06
4 new manholes 8 ft. deep	30.00	30.00	30.00	20.00
1 M. ft. b.m. sheeting	20.00	30.00	35.00	40.00
2700 sq.yd. reinforcement	0.15	0.17	1.12	0.25

CATALOG NOTICES

Union Iron Works, Hoboken, N. J. Catalog No. 20. Road builders' and roofers' equipment, pipe line supplies. Illustrated, 16 pages, 7x10 in.

Chicago Pneumatic Tool Co., Chicago, Ill. Bulletin No. 126. Compression riveters. Illustrated, 8 pages, 6x9 in. Bulletin No. 129. Hose, hose, couplings, hose clamp tools. Illustrated, 8 pages, 6x9 in.

The Consolidated Expanded Metal Co's., Braddock, Penn. Insert for loose leaf catalog. Highway bridges and culverts. Illustrated, 16 pages, 5½x7½ in.

Cling-Surface Co., 1032-48 Niagara St., Buffalo, N. Y. Bulletin. Cling-Surface treatment for ropes. Illustrated, 8 pages, 6x9½ in.

The Western Elaterite Roofing Co., Denver, Colo. Pamphlet. Specifications for laying Elaterite roofing. Illustrated, 4x9 in.

Ingersoll-Rand Co., 11 Brodway, New York. Form 3008. Class "PE-2" direct-connected electric driven air compressors. Illustrated, 40 pages, 6x9 in. Form No. 575. Instructions for installing and operating Class "PE" electric driven air compressors. Illustrated, 28 pages, 6x9 in.

General Electric Co., Schenectady, N. Y. Bulletin No. 4085. Battery-charging motor-generator sets for railway signaling. Illustrated, 16 pages, 8x10½ in. Bulletin No. A4086. Circuit breakers for railway service, Type MR. Illustrated, 2 pages, 8x10½ in.

Sprague Electric Co., 527-31 W. 34th St., New York. Catalog No. 327. Electric fans. Illustrated, 40 pages, 8x10½ in. Bulletin No. 115. Electrical equipment for buildings. Illustrated, 24 pages, 8x10½ in.

The Hydrex Felt & Engineering Co., 120 Liberty St., New York. Pamphlet. "Sound Transmission in Buildings—Its Prevention and the Use Therefor of Hygienic Materials." Illustrated, 24 pages, 6x9 inches.

The Heine Chimney Co., Chicago, Ill. Catalog. Interlocking radial brick chimneys. Illustrated, 32 pages, 4x9 inches.

The Bull Dog Dump Wagon Co., Boston Building, Kansas City, Mo. Pamphlet. Bull Dog dump wagon beds. Illustrated, 6x9 inches.

Spray Engineering Co., 201 Devonshire St., Boston, Mass. Bulletin No. 51. Air washers. Illustrated, 8 pages, 6x9 inches.

Stone & Webster Engineering Co., Booklet. Water Powers. Illustrated, 6x7½ inches.

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Catalog No. 42. Boyer railway speed recorder. Illustrated, 20 pages, 6x9 inches.

Joseph Dixon Crucible Co., Jersey City, N. J. Booklet. Graphtie brushes. Illustrated, 16 pages, 3½x6 inches.

Edgar Allen American Manganese Steel Co., McCormick Building, Chicago, Ill. Bulletin No. 56. Gyratory and jaw crusher wearing parts. Illustrated, 28 pages, 6x9 inches.

J. F. Donahoo, Woodward Building, Birmingham, Ala. Pamphlet. International safety railway ties. Illustrated, 6x9 inches.

Ohio Road Machinery Co., Oberlin, Ohio. Catalog. Road making and contracting machinery. Illustrated, 16 pages, 6x9 inches.

The Blake & Knowles Steam Pump Works, 115 Broadway, New York. Catalog. Single direct-acting pumps. Illustrated, 84 pages, 6x9 inches.

The Bristol Co., Waterbury, Conn. Bulletin No. 143. Recording differential pressure gages and recording flowrate meters. Illustrated, 16 pages, 8x10½ inches. Bulletin No. 170. Patent electric furnaces for soldering coppers. Illustrated, 2 pages, 8x10½ inches. Bulletin No. 1300. Class III recording thermometers. Illustrated, 48 pages, 8x10½ inches.

Clayton Air Compressor Works, 115 Broadway, New York. Bulletin No. 210. Printed in Spanish. Air compressors. Illustrated, 32 pages, 6x9 inches.

Westinghouse, Church, Kerr & Co., 37 Wall St., New York. Book No. 5. Work Done. Railroad shop edition. Illustrated, 46 pages, 6x9 inches.

Continental Car & Equipment Co., Inc., Highland Park, Louisville, Ky. Catalog C. P. Dump cars. Illustrated, 80 pages, 6x9 inches.

Alberger Pump & Condenser Co., 140 Cedar St., New York. Bulletin No. 15. Spiroflo centrifugal condensers. Illustrated, 24 pages, 6x9 inches.

The Strauss Bascule Bridge Co., 104 S. Michigan Ave., Chicago, Ill. Bulletin No. 1. Lift bridges. Illustrated, 20 pages, 8x10½ inches.

CONTRACTS TO BE LET

Sewer System Extension

Bronxville, N. Y.

Sealed proposals will be received by the Board of Trustees of the Village of Bronxville, at the office of said Board of Trustees in the Village Hall, Bronxville, New York, until 8 P. M. on the 8th day of July, 1913, and opened immediately thereafter, for the construction of an extension to the sewer system of said Village of Bronxville, said extension being known as Tanglewylde Ave. and Park Ave. in said Village, according to the maps and plans prepared by Geo. H. Rogers, Village Engineer, which said maps and plans have been approved by the State Department of Health, a copy of which is now in the office of the Village Clerk, Village of Bronxville, New York.

Plans, profiles and specifications may be seen and blank proposals obtained from Geo. H. Rogers, at his office in Dusenbury Building, Depot Square, Tuckahoe, New York.

The person submitting a proposal shall submit therewith a certified check issued by a State or National Bank, in good standing, within the State of New York, for 10% of the amount of his bid or proposal, to the Village of Bronxville, without conditions, to be forfeited to the Village in case the person making such proposal shall refuse to enter into a contract in accordance therewith, as liquidated damages, and not as a penalty.

The Board of Trustees reserve the right to reject any or all proposals or bids.

Proposals must be addressed to Frank Dinsmore, Village Clerk, Bronxville, N. Y., and endorsed, "Sewer Construction Proposals."

Dated June 18th, 1913.

FRANK DINSMORE,
Clerk of the Village of Bronxville.

Bids for Paving

Cohoes, N. Y.

Notice is hereby given that at a regular meeting of the common council of the city of Cohoes, N. Y., to be held on the 1st day of July, 1913, at 8 o'clock p.m., sealed proposals will be received for the paving of Bridge avenue, as per specifications prepared by the city engineer and on file in the office of the city clerk, pavement to be of vitrified brick, distance to be paved about 1,400 feet long and 35 feet wide.

A bond in the sum of 50 per cent. of the contract cost of the work will be required for the faithful performance thereof.

All proposals must be accompanied by a certified check to the amount of 5 per cent. of bid.

The common council reserves the right to reject any or all bids.

JOHN F. MAHONY, City Clerk.

Notice to Building Contractors

Schenectady, N. Y.

Sealed proposals will be received by the Board of Contract and Supply, of the City of Schenectady, New York, At their office in the City Hall Annex until 2:30 P. M. Wednesday, July 23d, 1913, for the general construction, plumbing and gas fitting, heating and ventilating and electrical work for the proposed three new schools for the Second, Ninth and Tenth Wards, Schenectady, N. Y.

Plans may be seen and specifications and bidding blanks procured at the office of the City Engineer and Architect, Mr. W. Thomas Wooley, No. 447 Franklin Street, Schenectady, N. Y. Blue Print plans, to a limited number, may be procured by any person so desiring, by depositing with the said Engineer and Architect the sum of $25.00.

BOARD OF CONTRACT & SUPPLY,
FRED E. JOHNSON, Secretary.

Bridge

Wilmington, Del.

Sealed proposals for the construction of the Third Street Bridge crossing the Christiana River, Wilmington, Delaware, will be received by the President of the Levy Court, New Castle County, at the Levy Court Room in the Court House, Wilmington, Delaware, until twelve o'clock noon of the 15th day of July, 1913, at which time all bids received will be publicly opened and read.

The substructure of the proposed bridge will embrace two concrete piers and two reinforced concrete abutments, section of new bulkhead and some alterations in the existing water main. Concrete work will amount to about 2500 cu. yds.

The superstructure will be composed of a movable bridge with a clear channel span of 150 ft. and two riveted truss approach spans, total length of superstructure being 416 ft. between the back walls of the abutment.

Separate bids will be required for the sub and superstructures.

Plans and complete data are on file in the office of the County Engineer, James Wilson, Church Building, Wilmington, Delaware, and in the office of the Consulting Engineer, J. E. Greiner, Fidelity Building, Baltimore, Md.

Plans, specifications, forms for contracts and proposals will be furnished contractors by the Consulting Engineer upon receipt of a deposit of $10.00 for each set. These deposits will be returned to bidders upon the return of the plans, etc., in a clean, undamaged and unmarked condition within ten days after the time of opening the bids. No deposits will be returned to those who have not submitted proposals and any bidder failing to return these plans, etc., within the specified time shall forfeit his deposit to cover the cost to the Engineer of replacing the same.

A certified check or acceptable bond to the amount of $1000.00 will be required with each bid as a guarantee of good faith.

The Levy Court reserves the right to reject any or all bids.

B. F. GROVES,
President of the Levy Court.
SAMUEL L. BURRIS, Chairman.
A. B. HOLLINGSWIRTH,
CHARLES GOODING,
Bridge Committee of the Levy Court of New Castle County, Wilmington, Delaware.

JAS. WILSON,
County Engineer.

Notice to Contractors

(Change of Date)

Sealed proposals for cleaning, pointing and waterproofing the exterior stone work and central court and two western courts of the State Capitol Building at Albany will be received by the Trustees of Public Buildings, Capitol, Albany, N. Y., until 4 o'clock P.M., on Monday, July 21st, 1913, when they will be opened and read publicly. Proposals shall be accompanied by a certified check in the sum of five per cent. of the amount of bid, and the contractor to whom the award is made will be required to furnish surety company bond in the sum of fifty per cent. of the amount of contract within thirty days after official notice of award of contract and in accordance with the terms of Specification No. 1699. The right is reserved to reject any or all bids.

The work will not necessarily be let to the lowest bidder, as consideration will be given to the references of each contractor, to successful operations performed by him and to his reliability and responsibility as a contractor.

Specifications may be consulted and blank forms of proposal obtained at the office of the State Architect, Capitol, Albany, N. Y.

LEWIS F. PILCHER,
State Architect.

Dated Albany, N. Y., June 9, 1913.

Sanitary Intercepting Sewers

Schenectady, N. Y.

Sealed Proposals will be received by the Board of Contract and Supply, of the City of Schenectady, New York, at their office in the City Hall Annex, until 2:30 P. M. Wednesday July 9th, 1913, for the construction of a 42-inch Sanitary Intercepting Sewer, from Nott Street along Front Street to North Ferry Street, and a 36-inch Sanitary Intercepting Sewer from the Proposed Sewage Pumping Station over private lands and Washington Avenue to near Fuller Street, Schenectady, New York. The approximate estimate of the amount of work to be done is as follows:

1a—	6a.	2930.0 lin. ft. of 42" Monolithic Concrete Sewer.
1b—	6b.	2930.0 lin. ft. of 42" Reinforced Concrete Pipe Sewer.
7a.	12a.	2950.0 lin. ft. of 36" Monolithic Concrete Sewer.
7b.	12b.	2950.0 lin. ft. of 36" Vitrified Pipe Sewer.
7c.	12c.	2950.0 lin. ft. of 36" Reinforced Concrete Pipe Sewer.
13.		30 Manholes, complete.
14.		5 Tons Cast Iron Pipe.
15.		500 lin. ft. of Tile Underdrains.
16.		200 cu. yds. of Rock Excavation.
17.		500 cu. yds. of Extra Earth Excavation.
18.		300 cu. yds. of Extra Earth Filling.
19.		100 cu. yds. of Extra Broken Stone Filling.
20.		10,000 feet B. M. Lumber for Foundations.
21.		20,000 feet B. M. Lumber for sheathing left in place.
22.		100 cu. yds. of Extra Concrete.
23.		10,000 pounds Extra Reinforcing Steel.

Alternate bids for 42-inch sewer are asked for monolithic concrete and reinforced concrete pipe, and for 36-inch sewer alternate bids are asked for monolithic concrete, vitrified pipe and reinforced concrete pipe.

For further particulars address Mr. W. Thomas Wooley, City Engineer and Architect, No. 447 Franklin Street, Schenectady, New York.

BOARD OF CONTRACT AND SUPPLY.
FRED E. JOHNSON, Secretary.

Passaic Valley Sewerage Commissioners

NOTICE TO CONTRACTORS

Notice is hereby given that the Passaic Valley Sewerage Commissioners have designated Tuesday, the twenty-ninth day of July, nineteen hundred and thirteen, at two o'clock in the afternoon, as the time when they will meet at their usual place of meeting, Essex Building, Clinton Street, Newark, New Jersey, to receive proposals, in writing, for the construction of the SOUTHERLY PORTION OF SECTION 6 of the Main Intercepting Sewer, in the City of Newark.

Particulars that may enable Contractors to Judge of the character of the work are given below:

APPROXIMATE QUANTITIES.
Southerly Portion of Section 6.
Station 9 + 00 to Station 26 + 00.

Item 1.—Earth Excavation and Refilling, in trench, for 150-inch sewer.....	1,700 linear feet.
Item 2.—Concrete Masonry in trench, Portland cement mortar.....	5,500 cubic yards.
Item 3.—Brick Masonry, in manholes, laid with Portland cement mortar, and appurtenant work	100 cubic yards.
Item 4.—Rock Excavation, in trench.....	7,000 cubic yards.

Drawings, form of contract and specifications, and blank form for proposal may be obtained at the Commissioners' office from William M. Brown, Chief Engineer.

The Commissioners reserve the right to reject any or all bids.

PASSAIC VALLEY SEWERAGE COMMISSIONERS.
JOHN S. GIBSON, Clerk.
June 10, 1913.

Sewage Pumping Station and Force Main

Schenectady, N. Y.

Bids will be received until 2:30 P. M. on Wednesday July 2nd, 1913, for the construction of a sewage pumping station, force main, and for the installation of pumping machinery appurtenances in North Ferry Street, Schenectady, N. Y. For particulars address Mr. W. Thomas Wooley, City Engineer and Architect, 447 Franklin St., Schenectady, N. Y.

Board of Contract and Supply,
FRED E. JOHNSON, Secretary.

Passaic Valley Sewerage Commissioners

NOTICE TO CONTRACTORS

Notice is hereby given that the Passaic Valley Sewerage Commissioners have designated Tuesday, the twenty-ninth day of July, nineteen hundred and thirteen, at two o'clock in the afternoon, as the time when they will meet at their usual place of meeting, Essex Building, Clinton Street, Newark, New Jersey, to receive proposals, in writing, for the construction of a part of SECTION 19 of the Acquackanonk-Garfield-Passaic Branch Intercepting Sewer, in the Borough of Garfield, N. J.

Particulars that may enable Contractors to Judge of the character of the work are given below:

APPROXIMATE QUANTITIES FOR A PART OF SECTION 19

Item 1.—Earth Excavation and Refilling, in trench, for 33-inch concrete sewer	2,600 linear feet.
Item 2.—Earth Excavation and Refilling, in trench, for 30-inch concrete sewer	2,800 linear feet.
Item 3.—Earth Excavation and Refilling, in trench, for 27-inch concrete sewer	900 linear feet.
Item 4.—Earth Excavation and Refilling, in trench, for 18-inch pipe and concrete sewer, including vitrified pipe, etc.	500 linear feet.
Item 5.—Concrete Masonry, in trench, Portland cement mortar.....	1,800 cubic yards.
Item 6.—Brick masonry, in manholes, laid with Portland cement mortar and appurtenant work	100 cubic yards.
Item 7.—Rock Excavation, in trench.....	100 cubic yards.

Drawings, form of contract and specifications, and blank form for proposal may be obtained at the Commissioners' office from William M. Brown, Chief Engineer.

The Commissioners reserve the right to reject any or all bids.

PASSAIC VALLEY SEWERAGE COMMISSIONERS.
JOHN S. GIBSON, Clerk.
June 10, 1913.

Passaic Valley Sewerage Commissioners

NOTICE TO CONTRACTORS

Notice is hereby given that the Passaic Valley Sewerage Commissioners have designated Tuesday, the twenty-ninth day of July, nineteen hundred and thirteen, at two o'clock in the afternoon, as the time when they will meet at their usual place of meeting, Essex Building, Clinton Street, Newark, New Jersey, to receive proposals, in writing, for the construction of the CENTRAL PORTION OF SECTION 6 of the Main Intercepting Sewer, in the City of Newark.

Particulars that may enable Contractors to Judge of the character of the work are given below:

APPROXIMATE QUANTITIES.
Central Portion of Section 6.
Station 26 + 00 to Station 40 + 00.

Item 1.—Earth Excavation and Refilling, in trench, for 150-inch sewer.....	1,400 linear feet.
Item 2.—Concrete Masonry, in trench, Portland cement mortar.....	4,500 cubic yards.
Item 3.—Brick Masonry, in manholes, laid with Portland cement mortar, and appurtenant work	50 cubic yards.
Item 4.—Rock Excavation, in trench.....	300 cubic yards.

Drawings, forms of contract and specifications, and blank form for proposal may be obtained at the Commissioners' office from William M. Brown, Chief Engineer.

The Commissioners reserve the right to reejct any or all bids.

PASSAIC VALLEY SEWERAGE COMMISSIONERS.
JOHN S. GIBSON, Clerk.
June 10, 1913.

Ditch and Levee Work

Elsberry, Missouri.

Sealed bids will be received at the office of James C. Welch, Secretary, at Elsberry, Missouri, by the Commissioners of the Elsberry Drainage District until 11 o'clock A. M., July 8, 1913, for Ditch and Levee Work aggregating 920,000 cubic yards.

Harman Engineering Co. of Peoria, Illinois, are the Engineers and will be glad to furnish further information upon inquiry.

Water Works

(Change of Date)

Burlingame, Calif.

Sealed proposals will be received by the Board of Trustees of the City of Burlingame, California, until 8:00 p.m., Monday, July 21st, 1913, for the furnishing of materials for and the construction of a distributing water system in accordance with the plans and specifications now on file in the Office of the City Clerk, consisting of the following approximate quantities subject to an increase or decrease at the option of the Board of Trustees.

3700	lin. ft.	of	8"	Bell & Spigot	Class	B pipe
27300	"	"	6"	"		"
68800	"	"	4"	"		"
35900	"	"	3"	Full Weight	galvanized	pipe
54800	"	"	2"	"	"	"

Necessary specials, fittings, valves, hydrants, valve boxes, service clamps, corporation cocks, service cocks, meters, meter boxes, cock boxes and other details shown on plans.

Bids will be received under one or all of three classifications, namely, (a) Materials only; (b) labor only; (c) both materials and labor.

Plans and specifications may be obtained from the City Clerk or from the Consulting Engineers of the City of Burlingame, Shipman, Denny and Rhame, Holbrook Building, San Francisco, Cal., upon a deposit of ten ($10) dollars, returnable upon the return of said plans and specifications.

The Board of Trustees reserves the right to reject any or all bids, or to accept any or a part of any, that in their judgment will be to the best interests of the said City.

A certified check made payable to the President of the Board of Trustees of the City of Burlingame, California, in the amount of ten (10) per cent. of the total amount of the bid submitted will be required with each bid.

SHIPMAN, DENNY AND RHAME, Consulting Engineers,
Holbrook Building, San Francisco, California.

Proposal for Extension to Drainage Pumping Station No. 1

SEWERAGE & WATER BOARD OF NEW ORLEANS,
New Orleans, La., May 28th, 1913.

Sealed proposals will be received by the Secretary, at the office of the Board, Room 508, City Hall Annex, until 12 o'clock noon the 28th day of July, 1913, for the construction of an extension to Drainage Pumping Station No. 1, including suction and discharge basins, which contract is designated 55-D.

Plans, specifications and blank form of proposal may be obtained at the office of the Board.

A deposit of $100.00 will be required of each applicant for a set of plans and specifications, which deposit will be refunded upon the return of the plans in good condition.

The right is reserved to reject any or all bids.

GEO. G. EARL, General Superintendent. F. S. SHIELDS, Secretary.

Water Works Improvements

Goldsboro, N. C.

Sealed proposals will be received by the Mayor and Board of Aldermen of the City of Goldsboro, N. C., until 3 P. M. July 1st, 1913, for building a Pumping Station and Filter Plant.

The work will consist of a brick pumping and filter building with 1½ million gallon mechanical filter, resetting old pumps, and about 6000 ft. of 12 inch force main.

Plans and specifications will be on file at the Mayor's Office in Goldsboro, and at the office of the Engineer at Charlotte, N. C.

Specifications and bidding form will be mailed on application to the Engineer.

No bid will be considered unless accompanied by a certified check for $1000.00 as an evidence of good faith.

The right is reserved to reject any and all bids.

J. R. HIGGINS, Mayor.

GILBERT C. WHITE, Engineer.
Charlotte, N. C.

Shaft Sinking

Contractors wishing to bid on sinking an inclined shaft (60 Degrees) 8 x 20 about 1000 feet deep, granitic rock, eastern location, may communicate with P. 1089, Engineering News, N. Y. City.

Passaic Valley Sewerage Commissioners

NOTICE TO CONTRACTORS

Notice is hereby given that the Passaic Valley Sewerage Commissioners have designated Tuesday, the twenty-ninth day of July, nineteen hundred and thirteen, at two o'clock in the afternoon, as the time when they will meet at their usual place of meeting, Essex Building, Clinton Street, Newark, New Jersey, to receive proposals, in writing, for the construction of the NORTHERLY PORTION OF SECTION 6 of the Main Intercepting Sewer, in the City of Newark.

Particulars that may enable Contractors to Judge of the character of the work are given below:

APPROXIMATE QUANTITIES.
Northerly Portion of Section 6.
Station 40 + 00 to Station 56 + 00.

Item 1.—Earth Excavation and Refilling, in trench, for 150-inch sewer	1,600	linear feet.
Item 2.—Concrete Masonry, in trench, Portland cement mortar	4,600	cubic yards.
Item 3.—Brick Masonry, in manholes, laid with Portland cement mortar, and appurtenant work	50	cubic yards.
Item 4.—Rock Excavation, in trench	300	cubic yards.
Item 5.—Furnishing, placing and maintaining Steel and Timber Sheeting, etc., between Station 26 + 75 and 28 + 75	Lump Sum	

Drawings, forms of contract and specifications, and blank form for proposal may be obtained at the Commisioners' office from William M. Brown, Chief Engineer.

The Commissioners reserve the right to reject any or all bids.

PASSAIC VALLEY SEWERAGE COMMISSIONERS.
JOHN S. GIBSON, Clerk.
June 10, 1913.

Toledo, Ohio.

Pipe and Appurtenances

SEALED PROPOSALS will be received at the Offices of the Water Commissioner, City Hall, until 12 noon, July 15th, 1913, for the fabrication and laying of about 27½ miles of reinforced concrete pipe and appurtenances on the line of the Sooke Water Supply gravity conduit, and in accordance with the requirements of the general specifications prepared by Wynn Meredith, Consulting Engineer, for such construction, pursuant to the provisions of By-law No. 814, and adopted by the Council.

Plans and Specifications can be seen, and Forms of Tender obtained, at the Sooke Water Supply Office, 1414 Douglas Street, Victoria, B. C.

The lowest or any Tender not necessarily accepted.

C. H. RUST,
Water Commissioner.

Victoria, B. C., June 14th, 1913.

Sewerage System

Dunn, N. C.

Sealed proposals will be received by the Mayor and Board of Commissioners of the Town of Dunn, N. C., until July 8, 1913, for building a System of Sewerage.

The Sewerage will consist of about 6 miles of pipe sewers, 8 inches to 24 inches diameter, and appurtenances.

Plans and specifications will be on file at the office of the Mayor at Dunn, N. C., and at the office of the Engineer at Charlotte, N. C., and copies of the specifications, form of proposal, etc., may be obtained from the Engineer.

No bid will be considered unless accompanied by a certified check for $1000.00, as an evidence of good faith.

The right is reserved to reject any or all bids.

M. L. WADE, JR., Mayor.

Engineer:
GILBERT C. WHITE,
Charlotte, N. C.

Installation of Sewage Pumping Machinery and Appurtenances

Schenectady, N. Y.

Bids will be received until 2:30 P. M. on Wednesday, July 2nd, 1913, for furnishing and supervising the installation of sewage pumping machinery and appurtenances. For particulars address Mr. W. Thomas Wooley, City Engineer and Architect, 447 Franklin St., Schenectady, N. Y.

Board of Contract and Supply,
FRED E. JOHNSON, Secretary.

Waterworks and Sewers

Monroe City, Mo.

Sealed proposals will be received at the office of the City Clerk, Monroe City, Missouri, up to one (1) o'clock p.m. of Tuesday, the 8th day of July, 1913, for furnishing material and labor and constructing a water works and sewer system, separate bids being entertained as follows:

1.—For furnishing material and labor (except as outlined in subsequent items of this notice) and constructing a water works system. Certified check $1000.00.

2.—For furnishing cast iron pipe and special castings F. O. B. cars Monroe City, Missouri. Certified check $500.00.

3.—For furnishing hydrants and valves F. O. B. cars Monroe City, Missouri. Certified check $100.00.

4.—For furnishing and erecting one 70,000 gallon steel tank, 100 feet high. Certified check $100.00.

5.—For furnishing one high speed engine for a 100 K.V.A. Generator, F. O. B. cars Monroe City, Missouri. Certified check $100.00.

6.—For furnishing pumping machinery F. O. B. cars Monroe City, Missouri. Certified check $100.00.

7.—For furnishing one 60 K.V.A. and 100 K.V.A. Generator, switch-board, lightning equipment, etc., F. O. B. cars Monroe City, Missouri. Certified check, $100.00.

8.—For furnishing all material and erecting a 400,000 gallon mechanical filter. Certified check $200.00.

9.—For furnishing one 72-inch by 18-foot boiler and one 48-inch by 80-foot steel stack F. O. B. cars Monroe City, Missouri. Certified check $100.00.

10.—For furnishing all material and labor and constructing Main sewers and Septic tank. Certified check $500.00.

All of the above material and work to be furnished and done in accordance with the plans and specifications on file at the office of the City Clerk, Monroe City, Missouri, and at the office of the office of the Engineers, Kansas City, Mo. Any one desiring extra copies of the plans for personal use may obtain the same from the Engineers by making a payment of five (5) dollars to cover the cost of the prints.

The City reserves the right to reject any and all bids and no bid will be considered which is not in accordance with the specifications and the requirements of this notice.

JAMES S. SCOTT, Mayor.

GEO. W. TOMPKINS, City Clerk.
BURNS & McDONNELL, Engineers,
Scarrett Building, Kansas City, Mo.

Bridge Approaches

Pittsburgh, Pa., June 23, 1913.

SEALED PROPOSALS for the building of concrete and stone approaches to the North Side Point Bridge will be received at the office of the City Controller, Municipal Hall, until 10:00 A.M., July 15, 1913. Estimated cost $375,000.00. Bids shall be made from the contract plans and specifications to be obtained on and after June 23, 1913, at the office of the Department of Public Works, Room 432 Henry W. Oliver Building, upon making deposits of $50 and $10, respectively, for same. Said deposits will be refunded upon return of the plans and specifications in good condition. Proposals must be accompanied by a bond in the amount of $187,500, duly and legally executed by the bidder with a surety or trust company which has complied with the city ordinances relating thereto.

WILLIAM A. MAGEE, Mayor.
JOSEPH G. ARMSTRONG,
Director, Department of Public Works.

Public Improvements

The Board of Public Works of the City of Esmeraldas, Ecuador, S. A., solicits tenders on the following improvements:

(a) Water supply for drinking and fire purposes;
(b) Sewers;
(c) Street paving;
(d) Building sea wall and dock.

Plans and specifications on record at the Consulate General of Ecuador, 11 Broadway, New York City.

U. S. ENGINEER OFFICE, New London, Conn., June 26th, 1913.—Sealed proposals for dredging in New Haven Harbor, Conn., will be received here until 2 o'clock, p.m., July 7th, 1913, and then publicly opened. Information on application.—G. B. PILLSBURY, Major, Engrs.

U. S. ENGINEER OFFICE, Mobile, Ala., June 21, 1913.—Sealed proposals for construction of ponton pipeline will be received at this office until 11 o'clock A.M., July 21, 1913, and then publicly opened. Information on application. C. A. F. FLAGLER, Lieut. Col., Engrs.

Sewage Settling, Reducing or Screening Plant

OFFICES OF THE BRONX VALLEY SEWER COMMISSION, NO. 2 GRAND STREET, WHITE PLAINS, N. Y.—Authority being given by and pursuant to the provisions of Chapter Six Hundred and forty-six of the laws of nineteen hundred and five as amended by Chapter seven hundred and forty-seven of the laws of nineteen hundred and seven; Chapter ninety-six of the laws of nineteen hundred and nine; Chapter three hundred and sixty one of the laws of nineteen hundred and eleven; Chapter eight hundred and sixty-nine of the Laws of 1911, and Acts amendatory thereof and supplemental thereto.

SEALED BIDS, in opaque envelopes, addressed to the Chairman of the Bronx Valley Sewer Commission and accompanied by a certified check in a separate envelope for at least five per cent. of the amount of security required for the faithful performance of the contract will be received up to July 12, 1913, at two o'clock P. M., for furnishing all the work and materials necessary for the

CONSTRUCTION of a Sewage Settling, Reducing or Screening plant to be located at the intersection of Bronx Valley Sewer with Tibbet's Brook, City of Yonkers, County of Westchester, New York, and work incident thereto. All in compliance with the details and conditions set forth in the

PLANS AND SPECIFICATIONS, which may be seen at the office of the Commission. The invitation to contractors, plans and specifications, form of bids, form of contract and form of bond or security may be obtained upon the payment of twenty-five dollars, to be repaid when said forms are properly used in bidding, but no plans, specifications, etc., will be given out later than the 10th day of July, 1913.

FORM OF BID must fulfill the requirements of the Invitation and be made out upon the printed Form of Bid as above obtained and the Commission expressly reserves to itself the right to reject any or all bids or to accept that one or those whose acceptance will, in its judgment, best secure the public interest and the efficient performance of the work mentioned.

BIDDERS may also submit other or different plans and specifications with bids for doing the work in accordance therewith. Such plans and specifications must comply with the stipulation entered into by the Commission with the Federal Government, a copy of which may be seen at the office of the Commission.

Dated June 23, 1913.

FRANK JEROME HOYLE, Chairman.
THOMAS J. CROTTY, Secretary.

U. S. ENGINEER OFFICE, Galveston, Texas, May 28, 1913.—SEALED PROPOSALS for constructing lock valves and operating gear, etc., will be received at this office until 12 M., June 27, 1913, and then publicly opened. Information on application. C. S. RICHE, Lieut. Colonel, Corps of Engineers.

U. S. ENGINEER OFFICE, Chicago, Ill., May 28, 1913.—Sealed proposals for constructing timber-concrete dock in North Branch Turning Basin, Chicago River, Ill., will be received here until 10 a.m., June 28, 1913. Information on application. GEO. A. ZINN, Lt. Col. Engrs.

U. S. ENGINEER OFFICE, Pittsburgh, Pa., June 9, 1913.—Sealed proposals for furnishing and delivering river-wall valve jacks, lock gate engines and gate operating gearing for Dams Nos. 7 and 9, Ohio River, will be received at this office until 12 M. (Eastern time) July 9, 1913, and then publicly opened. Information on application. FRANCIS R. SHUNK, Lt. Col. Engrs.

U. S. ENGINEER OFFICE, Room 802, Army Building, 39 Whitehall Street, New York City, June 4, 1913.—Sealed proposals for dredging in Hackensack River, N. J., will be received at this office until 12 M., July 5, 1913, and then publicly opened. Information on application. WM. T. ROSSELL, Colonel, Engineers.

U. S. ENGINEER OFFICE, Room 802, Army Building, 39 Whitehall Street, New York City, June 18, 1913.—Sealed proposals for dredging in Raritan River, N. J., will be received at this office until 12 M., July 19, 1913, and then publicly opened. Information on application. FREDERIC V. ABBOT, Colonel, Engineers.

(Extension of Time)

DEPARTMENT OF THE INTERIOR, U. S. RECLAMATION SERVICE, Washington, D. C., May 22, 1913.—Sealed proposals will be received at the office of the United States Reclamation Service, Elephant Butte, New Mexico, until 2 o'clock p.m., June 25, 1913, for furnishing sluice and penstock gates and accessories for Elephant Butte Dam, Rio Grande project, New Mexico-Texas. For particulars address the U. S. Reclamation Service, Elephant Butte, New Mexico; 307 Wright & Callender Building, Los Angeles, California, or Washington, D. C. F. H. NEWELL, Director.

Notice:

The date for opening bids on the above work has been postponed to July 10, 1913.

Passaic Valley Sewerage Commissioners

NOTICE TO DREDGING & DIVING CONTRACTORS.

Notice is hereby given that the Passaic Valley Sewerage Commissioners have designated Tuesday, the fifteenth day of July, nineteen hundred and thirteen, at two o'clock in the afternoon, as the time when they will meet at their usual place of meeting, Essex Building, Clinton Street, Newark, New Jersey, to receive proposals, in writing, for constructing Section 1 of the Passaic Valley Sewer in New York Bay, off Robbins Reef, in New Jersey.

Particulars that may enable Contractors to judge of the character of the work are given below:

QUANTITIES.

All bids will be compared on the basis of the Engineer's Estimate of Quantities of work to be done.

Item 1.	Furnishing and placing, in trenches dredged below the bed of New York Bay, two lines of 96-inch reinforced concrete pipes.....	3,000 linear feet
Item 2.	Furnishing and placing, in trenches dredged below the bed of New York Bay, reinforced concrete pipes, with horizontal and vertical branches, having diameters ranging from 24 to 96 inches.....	1,500 linear feet
Item 3	Furnishing and placing, Rip Rap, of ½ to 3-ton stones, in trenches, for 24 to 96-inch reinforced concrete pipes and branches.....	30,000 tons.
Item 4.	Rock Excavation, in dredged trenches	100 cubic yards

Drawings, form of contract and specifications, and blank form for proposal may be obtained at the Commissioners' office from William M. Brown, Chief Engineer.

The Commissioners reserve the right to reject any or all bids.

PASSAIC VALLEY SEWERAGE COMMISSIONERS.
JOHN S. GIBSON, Clerk.
May 6, 1913.

Cast Iron Pipe

Agawam, Mass.

Sealed bids will be received by the Board of Water Commissioners of the Town of Agawam, Mass., until 2 o'clock P. M., July 2nd, 1913, for the hauling and laying of 90,000 feet more or less of 8 inch, 6 inch and 4 inch cast iron pipe. Each bid will be accompanied by a certified check of $500.00 drawn upon a national bank and payable to the Town of Agawam. A bond in the sum of $5,000.00 with a surety company satisfactory to the Board will be required of the successful bidder for the faithful performance of the contract. Plans and Specifications are on file and can be seen at the office of the Engineer, James L. Tighe, 189 High St., Holyoke, Mass. The right is reserved to reject any or all bids.

E. A. KELLOGG, Chairman,
Feeding Hills, Mass.

JAMES L. TIGHE, Engr.

Paving Proposals

City of Bridgeport, Conn.

The Paving and Sewer Commission of the City of Bridgeport, Connecticut, will receive proposals at the office of its Secretary, Room 22, City Hall, in said City, until Tuesday, July 8th, 1913, at 8 o'clock, P. M., for paving the following named streets, in said City:

Park avenue, from State street to Atlantic street.
John street, from Broad street to Courtland street.
John street, from Courtland street to West avenue.

About 17,300 square yards in all.

Proposals will be received for either wood block, granite block, brick, or any other so called permanent pavement, on which a five-year guaranty can be obtained. Each proposal must be accompanied by a certified check or bank draft for five per cent. of the amount of bid, drawn to the order of the Treasurer of the City of Bridgeport.

Copies of specifications can be obtained from Alfred H. Terry, City Engineer, City Hall. The Commission reserves the right to reject any or all proposals.

THE PAVING AND SEWER COMMISSION,
BERNARD KEATING, Secretary.
Room 22, City Hall.

June 21, 1913.

Sewers

DEPARTMENT OF PUBLIC WORKS.
NOTICE TO CONTRACTORS.

City of Portland, Maine

SEALED PROPOSALS for building Section 2 of the East Side Intercepting Sewer and for building Sections 1 and 2 of the Fall Brook Branch of the East Side Intercepting System will be received at the office of the Commissioner of Public Works, City Hall, Portland, Maine, until Monday, July 14th, 1913, at 12 o'clock M., when they will be publicly opened and read. Each bid for each section must be accompanied by a certified check for $500.00. Said checks must be made payable to the order of the Treasurer of the City of Portland, Maine, and must not be enclosed with the proposal. A bond of some responsible surety company satisfactory to the Commissioner of Public Works, in the sum of twenty per centum of the amount of the bid, will be required of the successful bidder, for each section, to ensure the faithful performance of the conditions of the contract. Blanks on which proposals must be made, specifications and further information may be obtained at the office of the said Commissioner. Bids should be marked "Proposal for Building Section 2 of the East Side Intercepting Sewer," "Proposal for building Section 1 of the Fall Brook Branch," or "Proposal for Building Section 2 of the Fall Brook Branch" and addressed to BION BRADBURY, JR., Commissioner of Public Works, City Hall, Portland, Maine, who reserves the right to reject any or all bids, should he deem it for the interest of the City so to do.

Bridge Substructure and Other Masonry

NOTICE TO CONTRACTORS.

Uniontown, Penn.

Sealed Proposals in Duplicate will be received by the Controller of Fayette County and by the Controller of Washington County, until 12 o'clock noon, July 9, 1913, and Publicly opened and read at the Office of the Commissioners of Fayette County in Uniontown, Pa., at one o'clock P.M., July 10, 1913, for the construction of Piers, Foundations, etc., necessary in the building of a Steel Bridge, Viaduct and Approaches, over the Monongahela River, between South Brownsville and West Bronwsville, Pa. Plans, Specifications and other information are on file at the offices of the Controllers and the Commissioners of Fayette County and Washington County, where they may be seen by all parties interested. The same can be obtained from George Porter, Engineer for Fayette Co., Uniontown, Pa., Chaney & Armstrong, Engineer for Washington Co., Pa., or Hermann Laub, Consulting Engineer, Pittsburgh, Pa., upon application from a bona fide bidder accompanied by a deposit of $20.00, which will be returned after the Contract is made.

All Proposals must be made on the forms furnished, sealed, marked "Proposal—Masonry—Brownsville Bridge," and the copies sent to Fayette County must be accompanied by a Certified Check for Five Thousand ($5000.00) Dollars.

A Bond equal in amount to the Contract Price will be required.

The right is reserved to reject any and all bids.

HARRY KISINGER,
Controller of Fayette County.

JOHN H. MOFFIT,
Controller of Washington County.

Clock System

NOTICE TO CONTRACTORS.

Albany, N. Y.

Sealed proposals for Central Energy Clock System for the State Education Building, Albany, N. Y., will be received by the Trustees of Public Buildings, Capitol, Albany, N. Y., until 4 o'clock P. M., Monday, July 21, 1913, when they will be opened and read publicly.

Proposals shall be accompanied by a certified check in the sum of 5% of amount of bid, and the contractor to whom the award is made will be required to furnish surety company bond in the sum of 50% of the amount of contract within thirty days after official notice of award of contract, and in accordance with the terms of Specifications No. 12149. The right is reserved to reject any or all bids.

Drawings and specifications may be consulted and blank forms of proposal obtained at the office of the State Architect. Complete sets of plans and specifications will be furnished to prospective bidders upon reasonable notice to and in the discretion of the State Architect, Lewis F. Pilcher, Capitol, Albany, N. Y.

U. S. ENGINEER OFFICE, New London, Conn., June 26, 1913.——Sealed proposals for dredging in New Haven Harbor, Conn., will be received here until 2 o'clock p.m., July 25, 1913, and then publicly opened. Information on application. G. B. PILLSBURY, Major, Engrs

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 25, 1913.—Sealed proposals will be received at this office until 3 o'clock p. m. on July 25, 1913, and then opened for a pumping plant, a cooled drinking water supply system, etc., at the United States post office, Oklahoma City, Okla., in accordance with the specification and drawing, copies of which may be obtained from the custodian at Oklahoma City, Okla., or at this office, at the discretion of the Supervising Architect. O. WENDEROTH, Supervising Architect.

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 20, 1913.—Sealed proposals will be received at this office until 3 o'clock p. m. on the 18th day of July, 1913, and then opened, for additions and alterations to the mechanical system of mail-handling apparatus in the United States post office, St. Louis, Mo., in accordance with the specification and drawings enumerated therein, copies of which may be obtained at this office or at the office of the custodian at the post office, St. Louis, Mo., at the discretion of the Supervising Architect. O. WENDEROTH, Supervising Architect.

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 17, 1913.—Sealed proposals will be received at this office until 3 o'clock p. m. on the 21st day of July, 1913, and then opened, for repairs to the mechanical equipment of the United States Treasury and the Butler Building, Washington, D. C., in accordance with this specification, copies of which may be obtained at this office, at the discretion of the Supervising Architect. O. WENDEROTH, Supervising Architect.

PROPOSALS FOR TWO LOCK ENTRANCE Floating Caissons and their Equipment.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until 10.30 a. m., July 21, 1913, at which time they will be opened in public, for furnishing the above-mentioned articles. Blanks and general information relating to this Circular (No. 778) may be obtained from this office or the offices of the Assistant Purchasing Agents, 24 State Street, New York City; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal.; also from the U. S. Engineer Offices in the following cities: Seattle, Wash.; Los Angeles, Cal.; Baltimore, Md.; Philadelphia, Pa.; Pittsburgh, Pa.; Boston, Mass.; Buffalo, N. Y.; Cleveland, Ohio; Cincinnati, Ohio; Chicago, Ill.; St. Louis, Mo.; Detroit, Mich.; Milwaukee, Wis.; St. Paul, Minn.; Chattanooga, Tenn.; Louisville, Ky.; Mobile, Ala., and Galveston, Tex.; Commercial Club, Kansas City, Mo.; Chamber of Commerce, Quincy, Ill., and Commercial Club, Tacoma, Wash.—F. C. BOGGS, Major, Corps of Engineers, U. S. A., General Purchasing Officer.

U. S. ENGINEER OFFICE, Mobile, Ala.—Sealed proposals for dredging in Harbor at Mobile, Ala., will be received at this office until 11 A.M. July 25, 1913, and then publicly opened. Information on application. C. A. F. FLAGLER, Lt. Col., Engrs.

U. S. ENGINEER OFFICE, Jacksonville, Fla., June 21, 1913.—Sealed proposals for dredging and rock removal at Trout Creek Cut in St. Johns River, Florida, will be received at this office until 12 o'clock noon, July 21, 1913, and then publicly opened. Information on application. J. R. SLATTERY, Maj. Engrs.

U. S. ENGINEER OFFICE, Wilmington, Del., June 18, 1913.—Sealed proposals for dredging harbor at Wilmington, Del., will be received here until 11 A. M., July 17, 1913, and then publicly opened. Information on application. R. R. RAYMOND, Maj., Engrs.

U. S. ENGINEER OFFICE, Wheeling, W. Va., June 23, 1913.—Sealed proposals for constructing Lock and Dam No. 16, Ohio River, will be received at this office until 11 a.m. (Eastern time), July 23, 1913, and then publicly opened. Information on application. F. W. ALTSTAETTER, Major, Engrs.

U. S. ENGINEER OFFICE, 540 Federal Building, Buffalo, N. Y., June 5, 1913.—Sealed proposals for dredging at Ogdensburg Harbor, N. Y., will be received at this office until 11 a.m., July 3, 1913 and then publicly opened. Information on application. J. G. WARREN, Colonel, Engrs.

U. S. ENGINEER OFFICE, Room 707, Army Building, New York, N. Y., June 7, 1913.—Sealed proposals for dredging in Bay Ridge and Red Hook Channels, New York Harbor, N. Y., will be received at this office until 12 M., July 7, 1913, and then publicly opened. Information on application. S. W. ROESSLER, Col. Engrs.

U. S. ENGINEER OFFICE, CHICAGO, ILL., June 2, 1913.—Sealed proposals for rebuilding, with timber, superstructures over the Easterly and Southerly Breakwaters at Chicago Harbor, Ill., will be received at this office until 10 A.M., July 2, 1913, and then publicly opened. Information on application. GEO. A. ZINN, Lt. Col., Engineers.

U. S. ENGINEER OFFICE, CHICAGO, ILL., June 2, 1913.—Sealed proposals for furnishing fir timber for use in Chicago, Ill., District, f.o.b. cars at mills, will be received at this office until 10 o'clock A.M., July 2, 1913, and then publicly opened. Information on application to this office, or to U. S. Engineer Office, Seattle, Wash. GEO. A. ZINN, Lt. Col., Engineers.

WEST POINT, N. Y., June 14, 1913.—Sealed proposals in triplicate will be received here until 2 o'clock p. m. July 14, 1913, for furnishing material and labor for laying about 1300 feet of 20 inch cast iron pipe and building a small intake dam near Fort Montgomery, N. Y. For information apply to the Quartermaster, West Point, N. Y.

U. S. ENGINEER OFFICE, Dallas, Tex., June 16, 1913.—Sealed proposals for jetty work at Sabine Pass, Tex., will be received here until 12 M. July 16, 1913, and then publicly opened. Information on application. T. H. JACKSON, Maj., Engrs.

PROPOSALS FOR SALE OF PUBLIC PROPERTY—Fort Bayard, N. M., June 6, 1913.—Sealed proposals in triplicate will be received here until 10 A.M., July 9, 1913, for 2 Kewanee return tubular 100 H.P. boilers; 2 fifty KW. D.C. General Electric Company's engines and generators; switchboard complete for two generators; one seven and half tons York ice machine; one two tons Shule ice machine; 99 fifty pound ice cans and 2 steam pumps 14"x12"x9". Information furnished on application. Envelopes containing proposals should be marked: "Proposals for Sale of Public Property," and addressed to "First Lieut. C. E. HOLMBERG, Q.M."

WANTS

Positions Wanted, three cents per word, each insertion

Positions Open, Employment Agencies, For Sale } **five cents per word " "**

Miscellaneous, ten cents per word " "

Count four words for keyed address.

All advertisements payable in advance. No abbreviated words allowed.

Copy should reach us not later than 10 A. M. Wednesday for ensuing week's issue. Answers addressed to our care, 505 Pearl St., New York, will be forwarded.

No information given by us regarding any advertiser's address. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Advertisers are requested to acknowledge the replies received through this department.

POSITIONS WANTED

Mechanical and Electrical Engineers.

MECHANICAL ENGINEER, 33, technical school and 12 years' broad experience in various branches of engineering, including sales department, desires position in or near New York; at present employed. P. W. 1013, Eng. News.

MECHANICAL ENGINEER, graduate, desires position with good company where there is chance promotion; not afraid work; four years' experience general engineering work. P. W. 1108, Eng. News.

HIGH-CLASS MECHANICAL ENGINEER, American, 36; experience, five years detailed designing structural steel, power plant, hydraulic and metallurgical work; four years superintending engineer; seven years general superintendent of cement plants in charge of operation, maintenance, reconstruction and extensions; at present employed, desires better connection. P. W. 1112, Eng. News.

Civil Engineers

GRADUATE ENGINEER desires position; railroad maintenance and construction, water supply, steam and hydroelectric plants, heavy electric traction, operation and earning reports, shops and terminals. P. W. 8, Eng. News.

A HIGH CLASS AMERICAN CIVIL ENGINEER wants a first class position with good pay (foreign preferred); is a man who has and can swing big things and carry through big undertakings; speaks Spanish fluently; experience includes work in Mexico and South America; was construction engineer on heavy railroad work in Bolivia; just returned and ready for new opening. Reference (by permission) F. C. Hitchcock, manager, MacArthur Bros., John A. Hill, president, Hill Publishing Co. Other representative names on request. Address W. L. Gibson, Engineering News.

CIVIL ENGINEER, age 40, married, twenty years' general engineering experience in the United States and abroad is open for position United States or abroad, with large land owning concern as land development, drainage or reclamation engineer; first class in these lines; can organize department and carry on work of any magnitude; at present employed but is desirous of making a change. P. W. 1090, Eng. News.

CIVIL ENGINEER, M. I. T. graduate, 10 years' experience in railroad construction and general contracting in tropical countries. Have handled $1,000,000 worth of work. Leaving for South America, desires connection with railroad construction or contracting company to take advantage of new era opening with Panama Canal. Address, "South America," care of General Delivery, San Francisco, Calif.

GRADUATE CIVIL ENGINEER, (26) experience topographic and hydrographic surveys, earth and concrete dams, dredging, steam shovel work; structural detailing. P. W. 985, Eng. News.

GRADUATE CIVIL ENGINEER, age 31, experience in railroad surveys and construction, hydraulic surveys and reports, logging railroads, land surveys and subdivisions, water powers, now employed, desires position with company or consulting engineer in the South. P. W. 1056, Eng. News.

ADDITIONAL WANT ADVERTISEMENTS ARE ON PAGE 58

FIELD ENGINEER, thoroughly experienced on hydro-electric and mill construction, also surveys, all kinds, free Aug. 1; can handle big jobs. P. W. 1075, Eng. News.

CIVIL ENGINEER wants position as land and legal engineer with large first class concern; twenty years' railroad and other engineering experience; has specialized in this line; at present employed but is desirous of making a change. P. W. 1091, Eng. News.

GRADUATE ENGINEER, 5 years' heavy construction experience, reinforced concrete, hydro-electric plant, water supply; will consider position of commercial nature as well as engineering, prefer combination. P. W. 1074, Eng. News.

GRADUATE CIVIL ENGINEER, at present employed; six years' general experience, railroad preliminary and location, topography, stadia, land surveying; 2½ years on construction. P. W. 1006, Eng. News.

SCIENTIFIC GRADUATE, who believes in practical rather than theoretical efficiency, and has held executive positions on engineering and construction forces, desires position. P. W. 1104, Eng. News.

GRADUATE CIVIL ENGINEER, 27, now employed, desires position with contractor doing concrete work; will want to take an interest in same later. P. W. 1102, Eng. News.

TECHNICAL GRADUATE, four years field and office work; would like position with consulting engineer or contractor, but will take anything in civil engineering; employed at present but could report within one week. P. W. 1099, Eng. News.

Bridge and Structural

STRUCTURAL ENGINEER, 30, technical graduate, wants position as assistant engineer; experienced designer of mill buildings, bridges, turn tables; reliable estimator of structural steel; used to handling men in field and office; salary, $160; Middle West location preferred. P. W. 1111, Eng. News.

Surveyors

EXPERIENCED ENGINEER AND SURVEYOR desires charge of surveys or construction; sewers, water, streets and highways, concrete, earthwork, etc., city, farm and topographical surveys, subdivisions, country estate developments. P. W. 1106, Eng. News.

ENGINEER AND SURVEYOR desires position surveying large tracts of land, or making preliminary surveys for roads and railroads. P. W. 1107, Eng. News.

NEW YORK CITY SURVEYOR, seven years' experience surveying for title, acreage, topographical, subdivision and construction work, open for engagement. P. W. 1101, Eng. News.

YOUNG MAN AS LEVELER AND INSPECTOR on sewer, water-works, or concrete construction; location, West Indies or South America; speaks Spanish; thoroughly acclimated; first-class references; salary to start moderate. P. W. 1113, Eng. News.

Draftsmen

STRUCTURAL DRAFTSMAN, technical education, two years' experience; moderate salary. P. W. 1083, Eng. News.

EXPERT COMPUTER with varied field and office experience, desires responsible position in charge of intricate calculations. P. W. 977, Eng. News.

DRAFTSMAN, two years' experience in engineering department of large copper company desires position along this line; location immaterial; salary no object. P. W. 1114, Eng News.

Superintendents, etc.

CONTRACTORS' ENGINEER. Assoc. M. Am. Soc. C. E., technical graduate; wide experience structural steel, reinforced concrete, foundations, all branches building construction and estimates; good executive; minimum salary, $4000; New York interview. P. W. 13, Eng. News.

SUPERINTENDENT of construction, first class executive, broad experience; difficult foundations, locks, dams, bridges, building and industrial plant construction; concrete a specialty. P. W. 126, Eng. News.

WANTED—To become associated with a general contracting firm as estimator and superintendent, familiar with heavy railroad, canal, sewer and foundation work. Have also executive ability. At present employed in similar capacity. Age 37, 15 years' experience, salary $3600 per annum. P. W. 802, Eng. News.

SUPERINTENDENT OR CONSTRUCTION ENGINEER, M. Am. Soc. C. E.; 16 years' experience, railroad construction, docks, bridges, etc.; last eight years chief engineer and superintendent with railroad and contractors; speaks Spanish, and experience in the tropics; good executive and organizer; location immaterial; good references. P. W. 1014, Eng. News.

SUPERINTENDENT, hustler, 43, good organizer, 23 years' experience on general heavy construction. P. W. 1034, Eng. News.

SUPERINTENDENT, 37, practical, good organizer, thoroughly understands all kinds of construction work. P. W. 1073, Eng. News.

BOOKKEEPER AND ACCOUNTANT for contractors' office, age 32, desires position; 11 years' experience; thorough knowledge of bookkeeping, pay rolls, time keeping, and all duties connected with contracting; excellent references. P. W. 1081, Eng. News.

SUPERINTENDENT OF CONSTRUCTION open for position after July first, age thirty-one, married; for the past 10 years in responsible charge of the following classes of construction, water works, sewerage, railroads, canals and dams; engineering education, executive ability, good manager and able to secure results; can secure good organization, accustomed to working on large undertakings; will accept position on salary or percentage basis. P. W. 1085, Eng. News.

ARCHITECT AND CONSTRUCTION ENGINEER, technical graduate, 12 years' office and field experience design and construction of buildings, power, industrial, coal and grain handling plants, foundations, reinforced concrete, etc. P. W. 1115, Eng. News.

HUSTLING CONSTRUCTION SUPERINTENDENT, just finishing big job, wishes engagement on salary plus percentage of profits; broad experience and detail knowledge building railroads, tunnels, hydro-electric plants, locks, dams, canals, bridges, heavy grading and foundations, timber and steel erection; concrete tunnel and canal lining; massive concrete dams and locks; cofferdams, reinforced concrete railroad trestles, arches, walls, viaducts, buildings, flumes, culverts; expert on construction plant and methods; know how to handle work and men; age 36; references. P. W. 1087, Eng. News.

CHIEF ENGINEER, with executive ability, at present engaged, desires position as chief engineer and factory architect, or chief construction engineer, with responsible concern; designer of large manufacturing plants, both structural steel and reinforced concrete, including special machinery equipment, heating and ventilation, power plants, cold storage and ice plants, etc., familiar with construction costs; best of references, member A. S. M. E. and A. S. H. & V. E.; technical graduate, twelve years' experience, age 37; salary $4000. P. W. 1077, Eng. News.

CONTRACTOR'S ENGINEER AND GENERAL SUPERINTENDENT, technically educated, fifteen years in charge of some of the largest contractors' interests in the business, operating throughout the East and Middle West of both the United States and Canada; practically all branches of construction; last salary $5000; prefer reasonable drawing account plus share of profits; A-1 references, etc. P. W. 1072, Eng. News.

CHIEF ENGINEER or manager of construction, 36, member of technical societies, sixteen years' experience on location, design and in charge of construction of steam and electric railways, buildings, dams, and irrigation; has handled men in United States and abroad; can design, organize and direct; speaks Spanish fluently; will be at liberty on a few days' notice; New York interview. P. W. 1095, Eng. News.

SUPERINTENDENT OF CONSTRUCTION, ten years' broad experience tropics and United States; good executive; minimum salary, $3000. "S.," Room 1608, 31 Nassau St., N. Y. City.

ENGINEER SUPERINTENDENT now West, in charge design, construction of small bridges and dams; six years construction on railroads, bridges, buildings, dams, cofferdams; civil engineer education; age 26; location immaterial; references. P. W. 1103, Eng. News.

COLLEGE AND TECHNICAL GRADUATE, 1½ years railroad; designing, checking and estimating steel, masonry and reinforced concrete; track elevation and maintenance; expert in figuring, employed, desires position vicinity New York or Philadelphia; reference. P. W. 1110, Eng. News.

SUPERINTENDENT AND ENGINEER, expert on highway, dam and concrete construction; can furnish foreman and laborers if desired without charge; liberty in short time; Eastern States; salary, $2500 to start. P. W. 1109, Eng. News. News.

POSITIONS OPEN

STRUCTURAL DRAFTSMEN, must have had at least two years' experience in steel detailing, checking and drafting; location New York City; state full particulars in first letter. P. 970, Eng. News.

MAN WANTED to immediately take charge of evaporating plant at Niagara Falls. Experience required in pipe and pump repairs, coal economy and handling men. Salary $1500. P. 984, Eng. News.

WANTED—By Mosher Manufacturing Company, Dallas, Texas, an experienced detailer and checker, as applied to ornamental iron work; one familiar with detailing and checking stair work, elevator enclosures, store fronts and miscellaneous iron; state in detail experience, age, nationality, married or single. Address all applications after June 16th, to J. H. Brillhart, 416 E. 5th St., South Bethlehem, Penn., to arrange for personal interview in Philadelphia the latter part of June.

FIRST CLASS STRUCTURAL DRAFTSMEN and checkers wanted; state age, salary expected and nationality. Apply Noelke-Richards Iron Works, Indianapolis, Ind.

MECHANICAL ENGINEER wanted to design extensions and improvements for a group of portland cement factories, with prospect of position of general superintendent; must be experienced designing, erecting and operating heavy machinery, but knowledge of cement industry not so essential as ability and personal qualities; give record and state salary expected. P. 1078, Eng. News.

CONCRETE INSPECTORS who have had experience on heavy cyclopean masonry, wanted for work on dam in Alabama; in making application give age, education, full references and details of past experience, and salary expected; also want instrumentman thoroughly familiar with laying out of complicated concrete foundations on hydraulic work. Address A. C. Polk, Resident Engineer, Lock 12, Clanton, Ala.

AN EXPERIENCED ESTIMATOR AND SOLICITOR wanted; must be thoroughly familiar in high and low pressure steam and hot water installations. Write experience and salary expected. All communications confidential. John A. Scollay, Inc., 70-76 Myrtle Ave., Brooklyn, N. Y.

CONTRACTING ENGINEER; must have had thorough experience in estimating and designing structural steel and bridges and some experience in contracting; this is an exceptionally good opening for a man with necessary technical experience and education who can make good at contracting. P. 1093, Eng. News.

EXPERIENCED DRAFTSMEN wanted for structural and ornamental iron work; state experience, reference and salary wanted. The Herzog Iron Works, St. Paul, Minn.

THOROUGHLY EXPERIENCED PRACTICAL ENGINEER for manager of erection on light bridge and structural-steel work. P. 1105, Eng. News.

FIRST-CLASS REINFORCED-CONCRETE FOREMAN on bridge work wanted at once; one with experience in water and foundation work preferred; none but men who can produce results need apply; state salary wanted, reference and last position. P. 1100, Eng. News.

MISCELLANEOUS

WANTED—Graduate engineer willing to take substantial interest with practical New York City contractor. M. 760, Eng. News.

EMPLOYMENT AGENCIES

SEVERAL DRAFTSMEN and engineering graduates wanted. Cleveland Engineering Agency, Cleveland.

ENGINEERING DRAFTSMAN for steel concrete, maps, special track work, buildings and bridges of all kinds; also architectural draftsmen. Special inducement to men with previous experience along any of these lines. Don't fail to investigate our methods. We guarantee to secure you the position you want or no charge. Twenty years in business handling engineering positions exclusively behind this guarantee. The Engineering Agency, Monadnock Building, Chicago.

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[48" Gauge]

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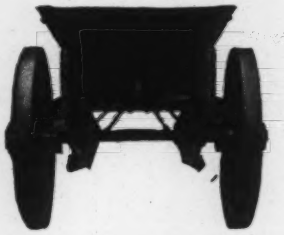

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Mounted on 4 Steel Trucks

1 Acme No. 9 1-2 Solid Steel Stone Crusher—receiving capacity 10 1-2 x 18"
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Equipped with Acme Special Steel Chain and all driving connections
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100 tons 40 pound Rails,
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Drag Line Machine, with 70 ft. boom, 2-yd. bucket. All-steel construction. Now located on Pacific Coast. Will make terms to suit.

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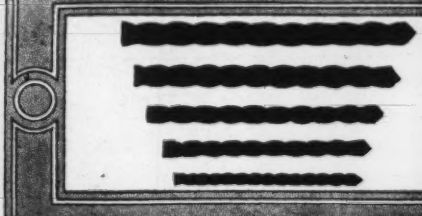

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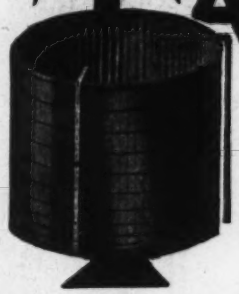

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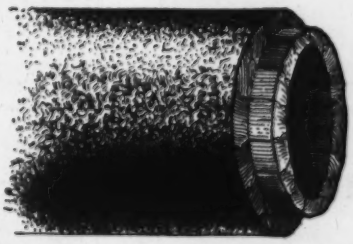

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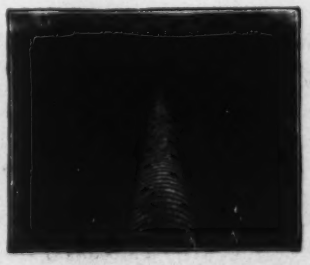

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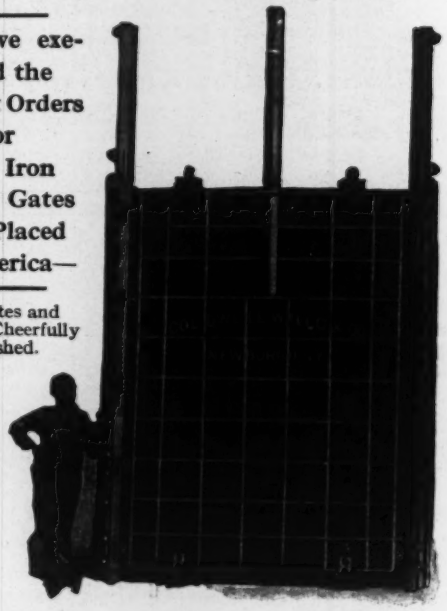

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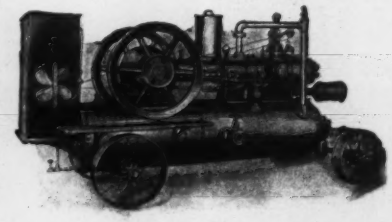

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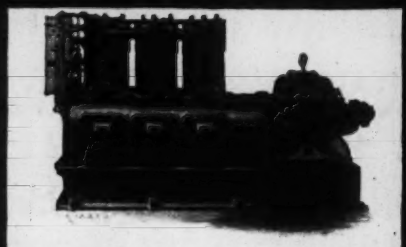

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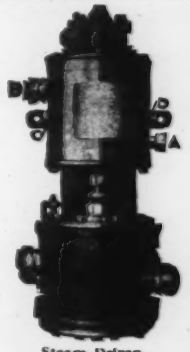

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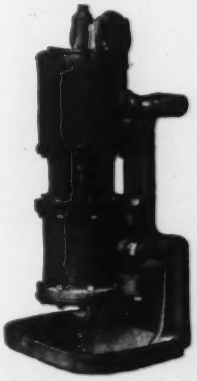

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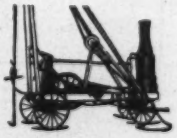

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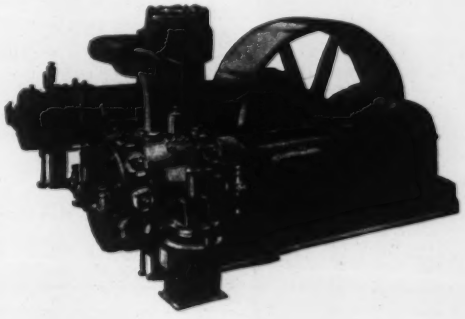

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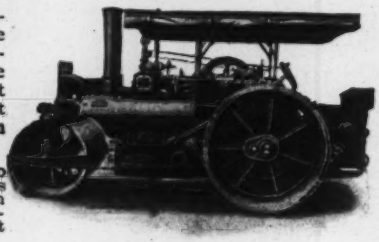
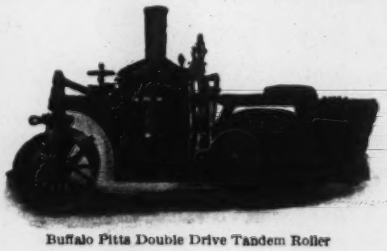


Buffalo Pitts Macadam Roller



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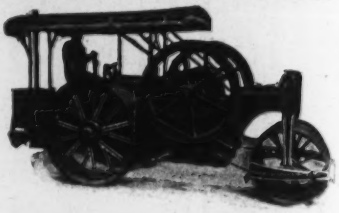

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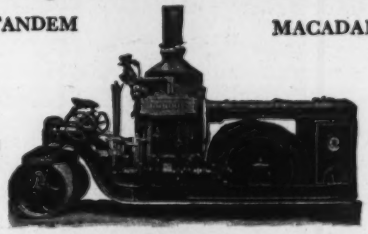

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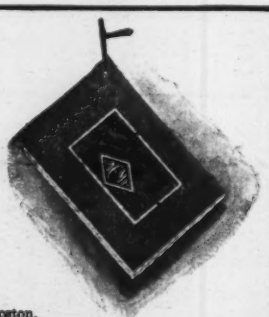

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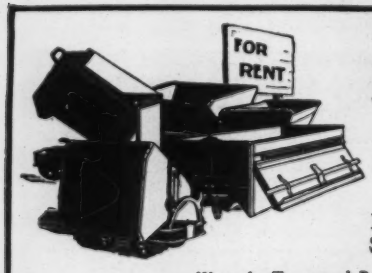

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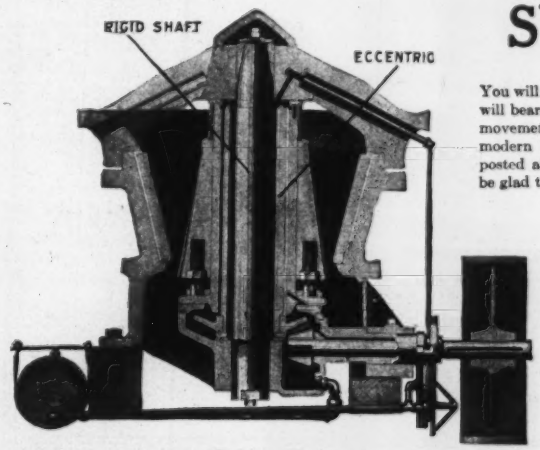

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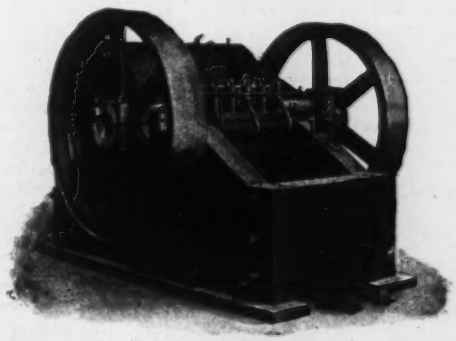

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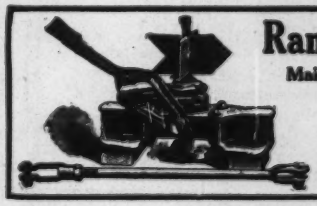

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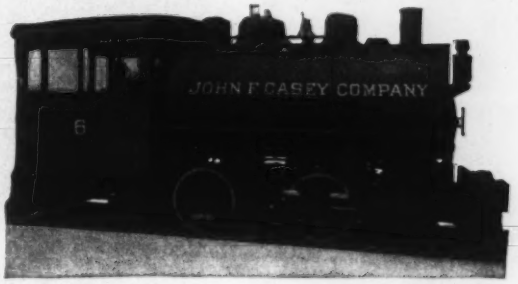

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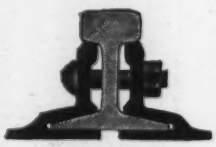
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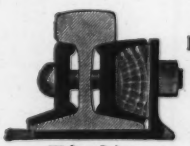
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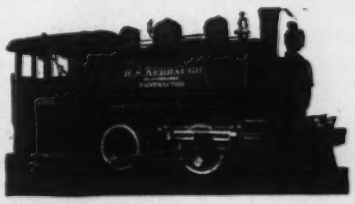

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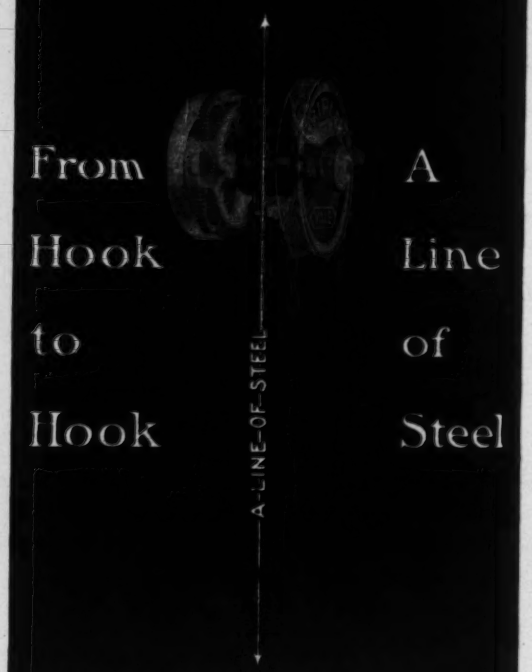

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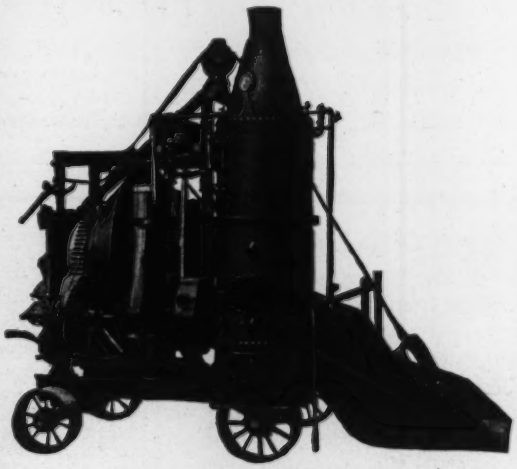

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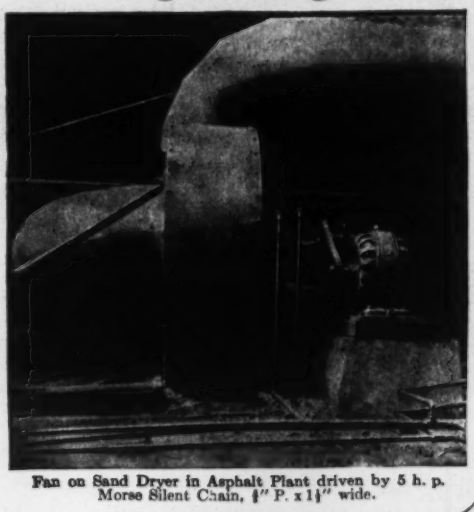

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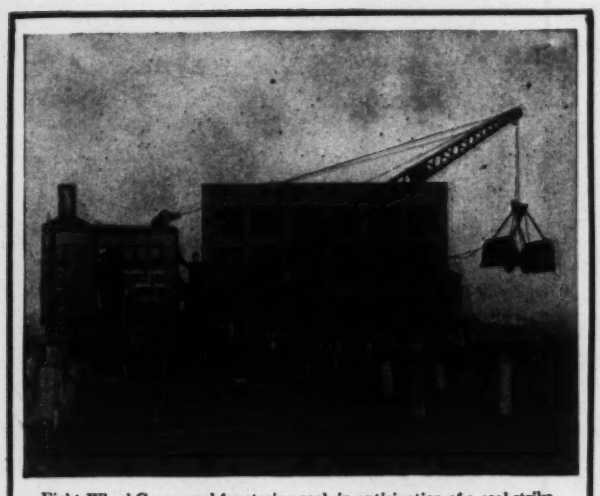

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For **Speed, Economy and Durability** investigate the merits of the **"Ohio."**

Accompanying illustrations show two different styles of our cranes being operated by the B. F. Goodrich Company, (Diamond Rubber Plant), Akron, Ohio.

As we manufacture Locomotive Cranes only we have several experts in our Engineering Department whose services are free for solving your problems.

Our catalogue No. 5 will prove interesting to you.

The Ohio Locomotive Crane Co.

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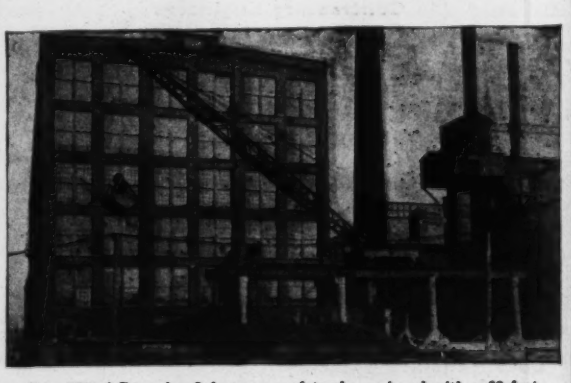

Four-Wheel Crane for 8 foot gauge of track, equipped with a 60 foot boom and mounted on a trestle 32 ft. high, electrically operating a 1½ cubic yard bucket for handling coal.

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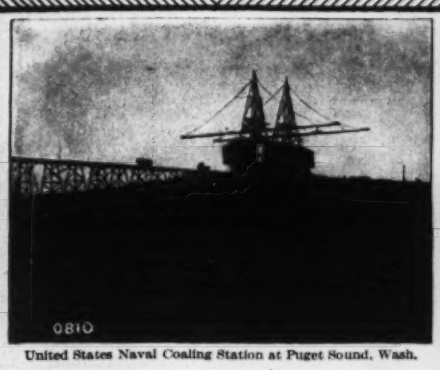

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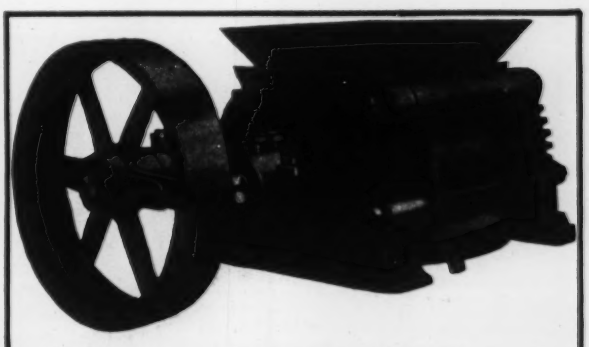
C. W. HUNT COMPANY, Inc.
WEST NEW BRIGHTON, NEW YORK
Designers and Manufacturers of Apparatus for the Automatic Handling of Bulk Material. 22



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The Jeffrey Single Roll Crusher

will Reduce Large Coal to any desired size in a Single Operation.

Without clogging or breaking with less power than any other machine on the market.

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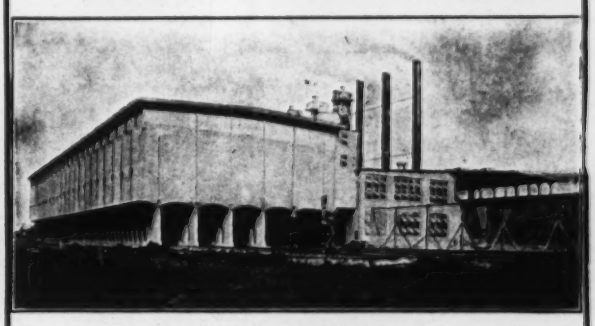

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Coal Handling Systems and the Darley Suction Conveyor.

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FOR ALL CLASSES OF WORK

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HARRISON, N. J.

The Brownhoist Grab Bucket fills itself in crushed rock, lump coal and in any other loose material

The spades are so shaped that when digging the material gathered causes the bucket to dig deeper into the material insuring a full load.

And when digging the bucket is prevented from skidding over any lumps by the spades being at an angle and never horizontal, by the side portion of the spades being cut away, as shown, and by the high closing power of the bucket.

Write for catalog E which shows how and where the Brownhoist Grab Buckets are used.

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Locomotive Cranes

A Big Factor in Reducing Operating Expenses

FOR when not used for coaling purposes, Industrial Works Locomotive Cranes can be used for excavating, placing shoring, handling concrete forms and concrete, and doing other contracting work.

Or replacing a bucket with a magnet, scrap may be handled with great economy. These machines may have two 4-wheel trucks, steam brakes and all M. C. B. equipment so that they can also be used for switching purposes. Cranes described in our catalog range in capacity from 5 tons to 150 tons, and represent the experience of years in the manufacture of this kind of machinery.

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Specialists in Digging Machinery

Orange Peel **Clam Shell** **Drag Line Buckets**

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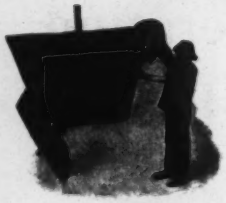

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Controllable Bottom Dump Bucket (Patented)

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The bucket that is as nearly as possible indestructible. No higher in price that any other *good* bucket.

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The illustration shows a standard Williams excavating bucket, weighing 3480 lbs., digging iron concentrates weighing 280 lbs. per foot at the plant of the Pennsylvania Steel Company at Lebanon, Pa.

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FOR EVERY KIND OF A JOB

Represent the latest development in modern bucket design.

Each of the over 200 types is specially adapted for a certain class of work.

Our engineering department will be glad to assist you in selecting the *right* bucket for your requirements.

Special buckets built to order.

Write for "The Bucket Book," that fully describes the Williams Line.

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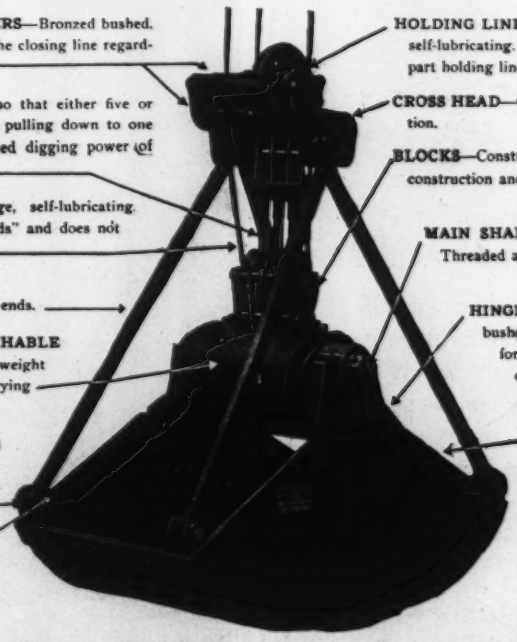
1513-15 Rockefeller Building Cleveland, Ohio

Principal Features of Owen Clam Shell Buckets



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CLOSING POWER—Can be adjusted so that either five or seven parts of closing line are always pulling down to one part pulling up, giving an undiminished digging power of seven or five to one at all times.

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ARMS—Heavy forgings; bushed at both ends.

COUNTERWEIGHT AND DETACHABLE JACKETS—Of solid cast iron. Adjust weight and digging power of the bucket to varying conditions.

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HOLDING LINE SHEAVE—Extra large bronze bushed, and self-lubricating. Can be reeved for both single and double part holding line.

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"1913"

BOOM 100 FEET LONG

TYPES—
STEAM—
ELECTRIC—
SELF PROPELLING

A POWERFUL DIGGER
HIGH SPEED SWINGER
EASY CONTROL
MAXIMUM CAPACITY
LOWEST COST PER
CUBIC YARD EXCAVATED

"Owing to the equal distribution of weight and the fact that our machines are well balanced, our 100-ft. boom, 2¼ cubic yard excavator weighing 130 tons has moved with its own power from one section of this track to another, namely 15 ft. in 7 minutes, requiring only two track men besides the regular crew on the excavator."

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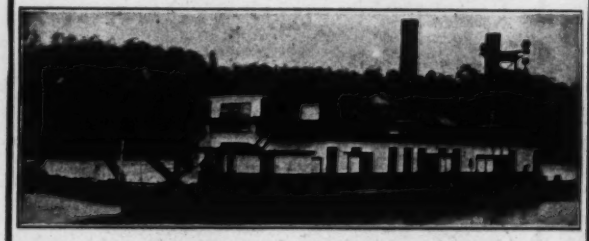

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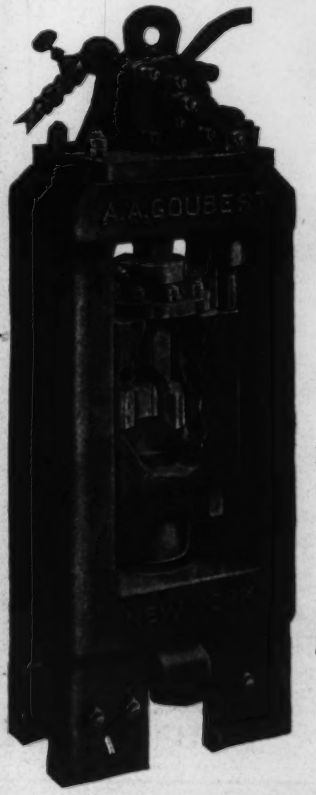

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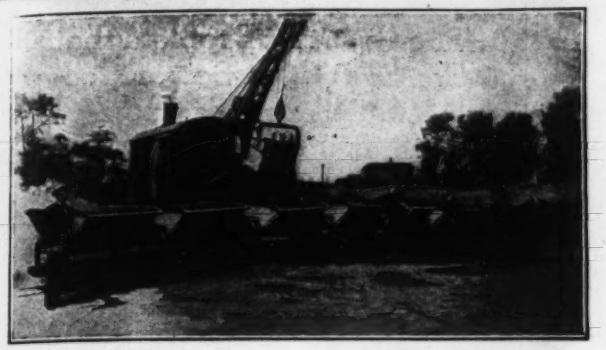

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FULL CIRCLE SWING STEAM SHOVEL

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The shovel swings through a complete circle, delivering the excavated material at any desired point.

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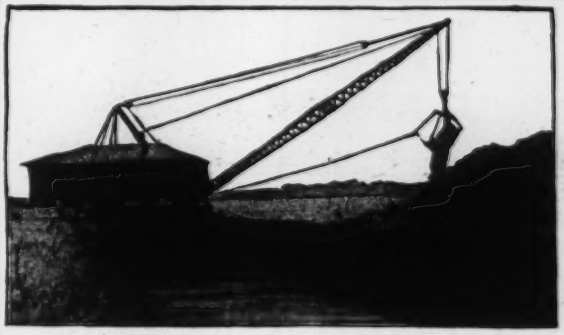

The Gasoline Power Drag Line Excavator

Look at that illustration. It looks like an ordinary steam power drag line excavator, doesn't it, except that it has no smoke stack?

That's the gasoline power Monighan Steel Drag Line Excavator, the *first* successful drag line excavator to be run by gasoline power.

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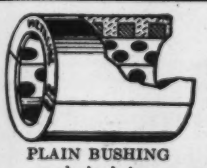

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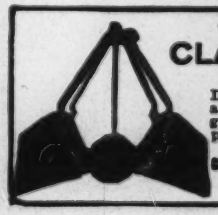

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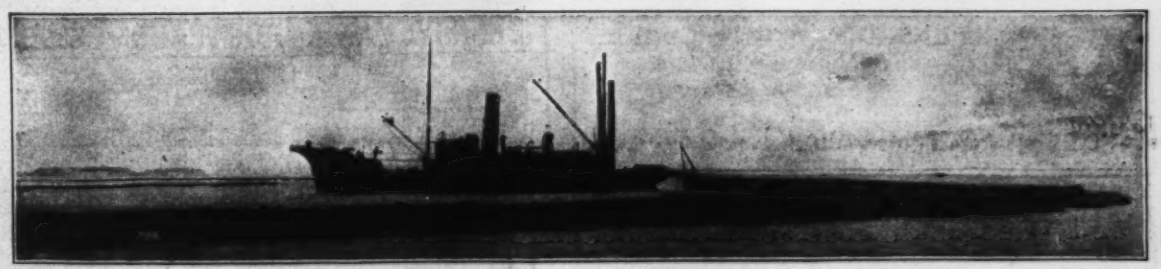

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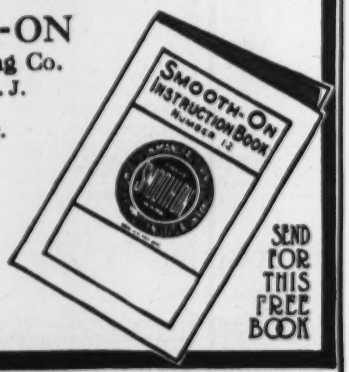

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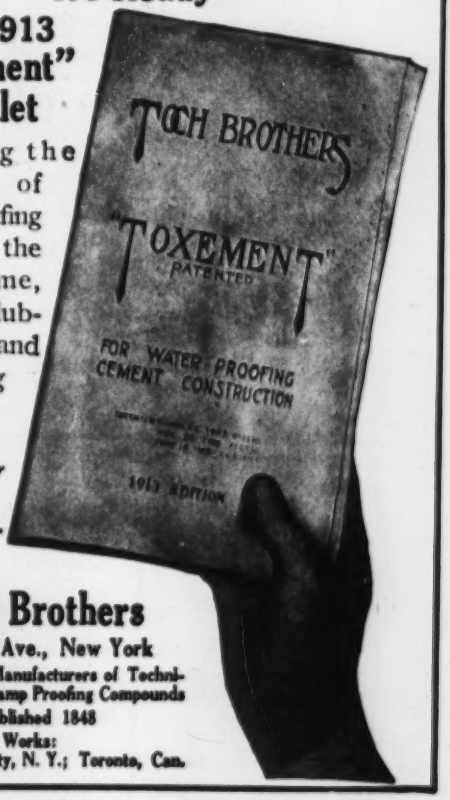

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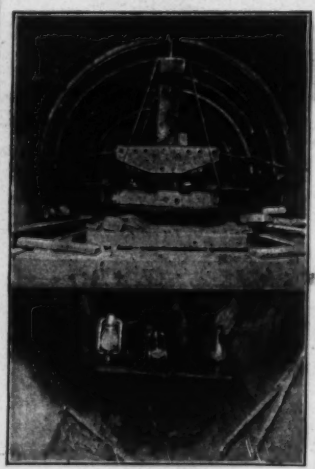

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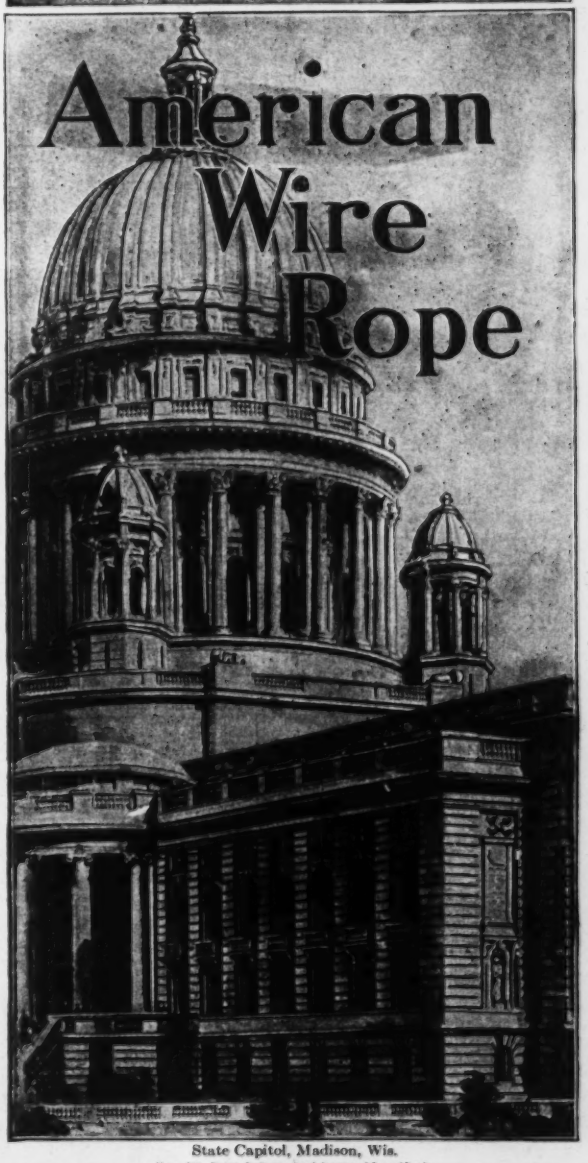

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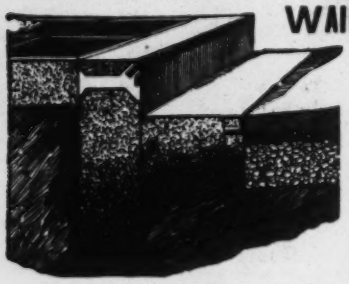

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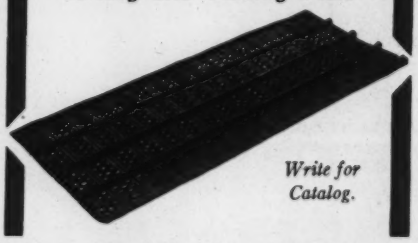

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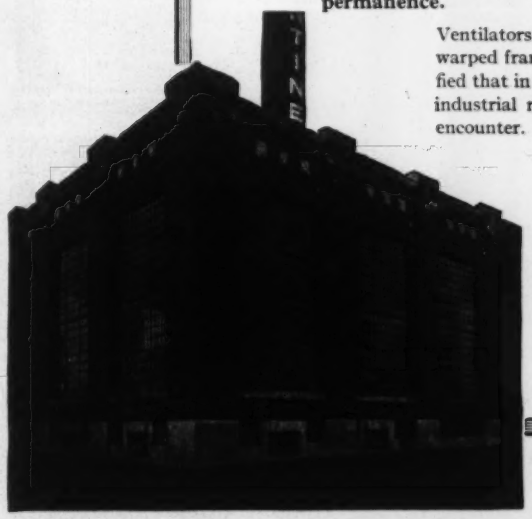

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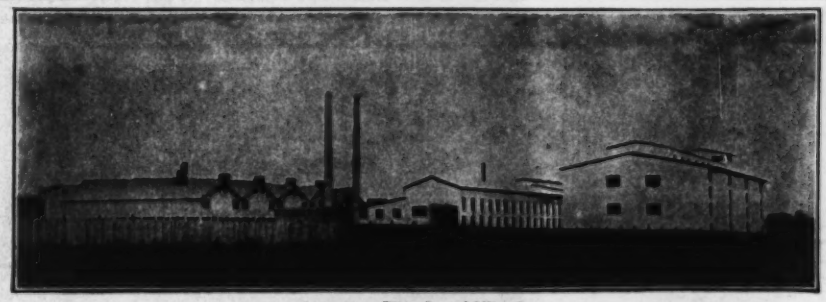

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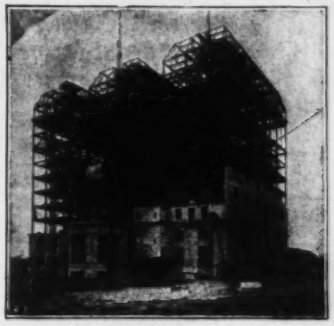

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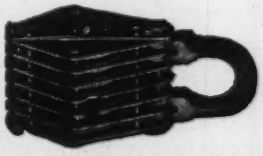
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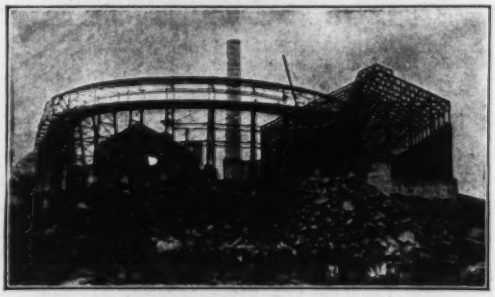

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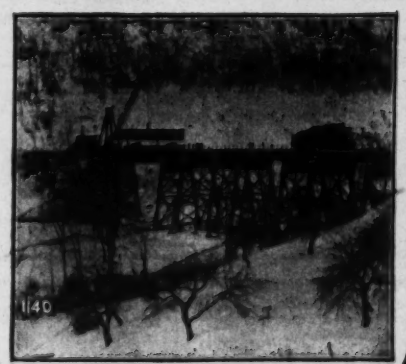

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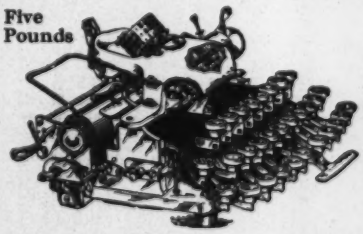

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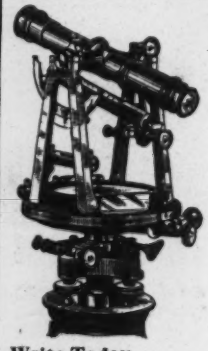

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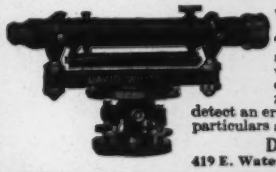

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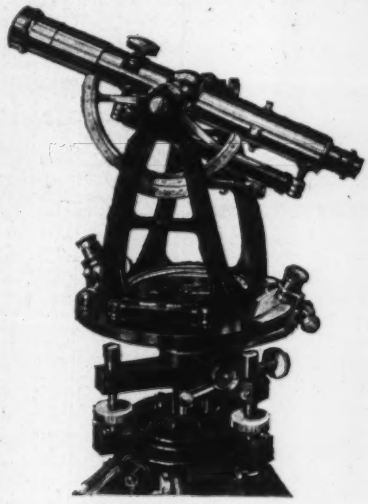

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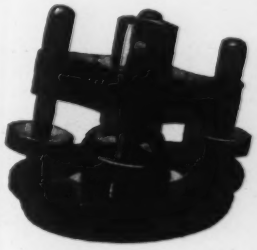

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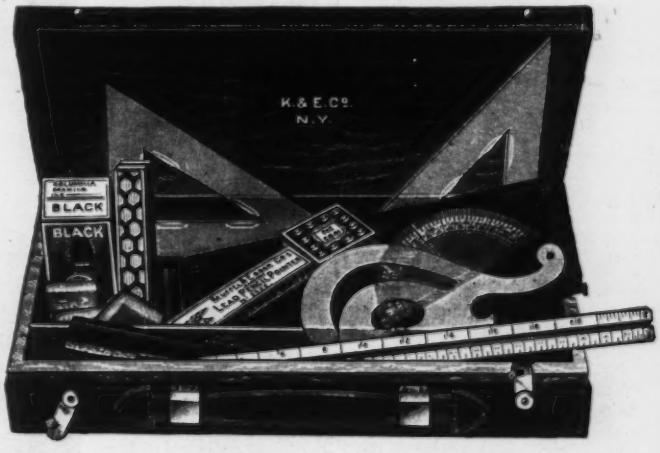

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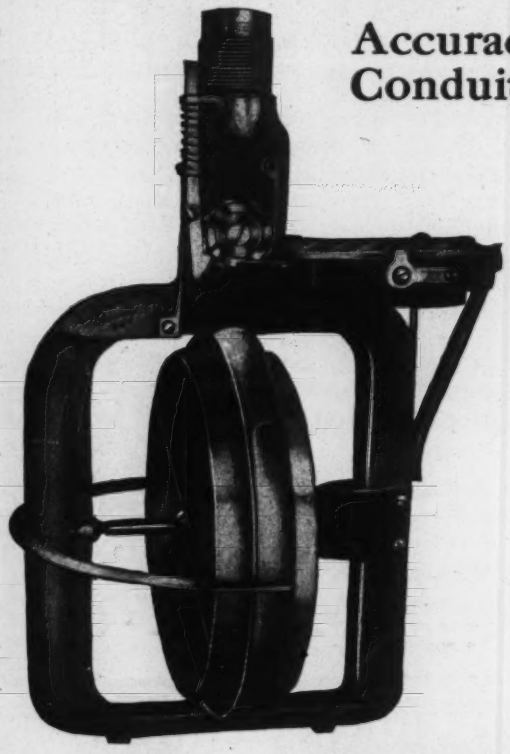

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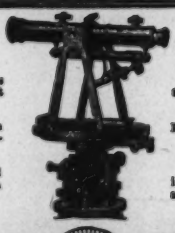

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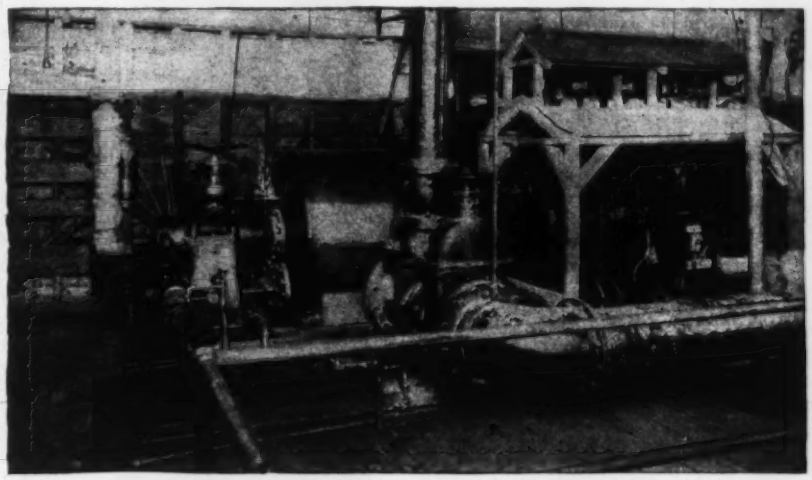

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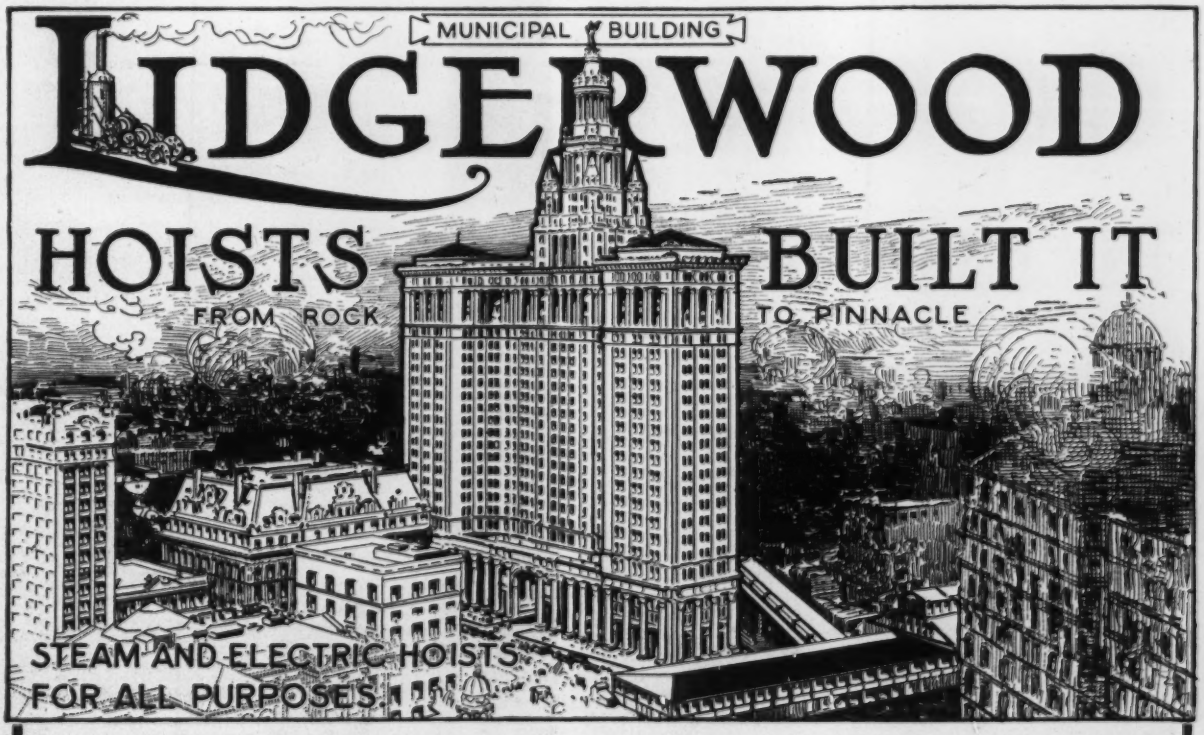

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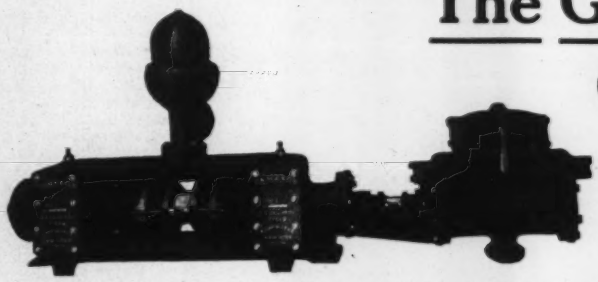

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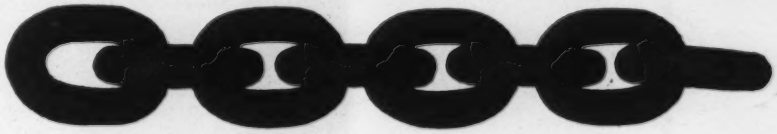

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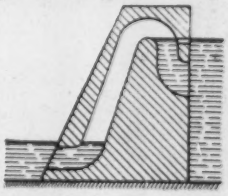

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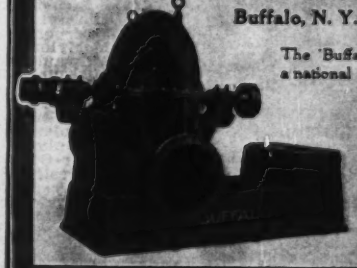

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THAT Burt Ventilators are selected by discriminating buyers, is evidenced by the many representative plants now using "Burts" for their exacting requirements.

The U. S. Steel Corporation has recently placed its 176th order for Burt Ventilators, making a total of 302 now in use.

The question of economical handling of the light and ventilation problems of industrial plants is successfully solved by the Burt Glass Top Ventilator. One of the important characteristics, is that this type constitutes both a skylight and a ventilator, eliminating the necessity for any other skylight and for ventilating system. The "pulling power" of the "Burt" is far greater than other stationary types because air shaft is unobstructed and the sliding sleeve damper is unaffected by air currents and thus a smaller number of "Burts" is required for ventilating a building. Whether open or closed, the passage of daylight is unobstructed, a feature accomplished by our patented sliding sleeve damper.

The Burt Ventilator is the ideal type for dark and dingy boiler houses having atmospheres saturated with gases and fine particles of coal dust. And there is no other cost after installation. Could anything be more ideal in service?

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The Burt Manufacturing Company

700 Main Street, Akron, O., U. S. A.

We also manufacture a complete line of Exhaust Heads and Oil Filters.

Geo. W. Reed & Co., Sole Manufacturers of "Burt" Ventilators in Canada.

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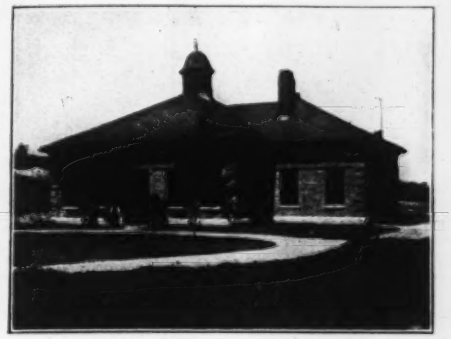

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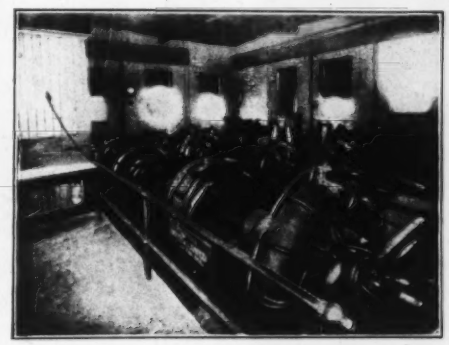

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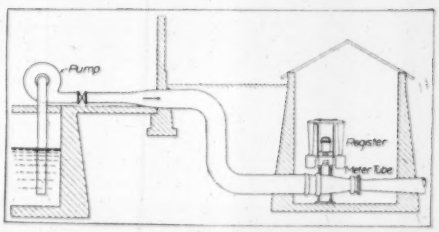

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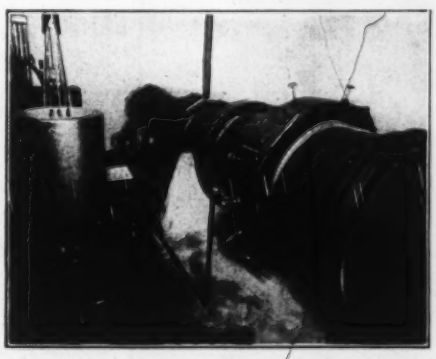


Figure No. 4.

Venturi Sewage Meter at Salem, Mass.

Venturi Meters for sewage have been in successful operation since 1903 when a 48″ sewage meter was installed in Boston. Since that date many installations for this kind of service have been made.

We present a few illustrations showing the Sewage Pumping Station at Salem, Mass., where a 30″ Venturi Meter has been of distinct service in at least four different ways. This meter was installed in 1906.

FIRST. In combination with another 30″ Venturi Meter which measures the sewage from Peabody, it makes possible an equitable division of operating expenses by the two municipalities.

SECOND. It shows what combination of speeds and heads is most efficient for any given conditions, also when it is advisable to increase or decrease the number of pumps running.

THIRD. It shows when the impellers of the centrifugal pumps become sufficiently clogged to require cleansing.

FOURTH. The chart records from the meter together with graphical records of the water elevations and readings of the electric current meter show the City Engineer exactly what has taken place during each hour of the entire day.

FIG. 1 shows the exterior of the pumping station, which is located at Cat Cove. The sewage is discharged through a submerged force main about 10-000 feet long which terminates far from shore under the harbor. The tide rises and falls about 8 feet and this combined with fluctuations in the suction well levels make a wide range in the total working head.

FIG. 2 is a general view of the interior of the station and shows the four pumping units, each consisting of a Volute centrifugal pump directly connected to an alternating current motor. The pumps run at either 450 or 600 revolutions per minute and their outlet pipes discharge into the 30″ main in which is set the Venturi Meter Tube, as shown by FIG. 3.

FIG. 4 shows the interior of the vault which contains the Meter-Tube and its Register and Chart Recorder. Provision has been made for keeping the Register filled with oil and no trouble has resulted from the solids and gummy matter present in the sewage although this particular sewage contains more than the usual percentage of such material because of the numerous leather tanneries within the drainage area.

OUR TWENTY YEARS' VENTURI METER EXPERIENCE IS AT YOUR DISPOSAL.

BUILDERS IRON FOUNDRY, Providence, R. I.

Barrett Specification Roofs

Seavy Hardware Co.,
Roofers.

Bursley Building, Fort Wayne, Ind.
Mahurin & Mahurin, Architects.

Not An Experiment

WHEN a practical man has a large building to roof, like this one, he cannot afford to take any chances. He does not want an experiment. He wants a roof of proved merit. That is why Barrett Specification Roofs are so popular.

Roofs constructed according to the principles laid down by the Barrett Specification have been giving satisfaction for *more than sixty years*.

Such a roof is constructed of five plies of tarred felt, with coal tar pitch as the waterproofing material, and covered with a top surface of gravel, slag or tile. Its life is usually 20 years or more; it rarely requires attention during that period, and is fire retardant.

Ask our nearest office for a free copy of the Barrett Specification It will convince you that such a roof is bound to give satisfaction.

SPECIAL NOTE

We advise incorporating in plans the full wording of The Barrett Specification, in order to avoid any misunderstanding. If any abbreviated form is desired, however, the following is suggested.

ROOFING—Shall be a Barrett Specification Roof laid as directed in printed Specification, revised August 15, 1911, using the materials specified and subject to the inspection requirement.

Hydronon

The Damp-proofing Paint.

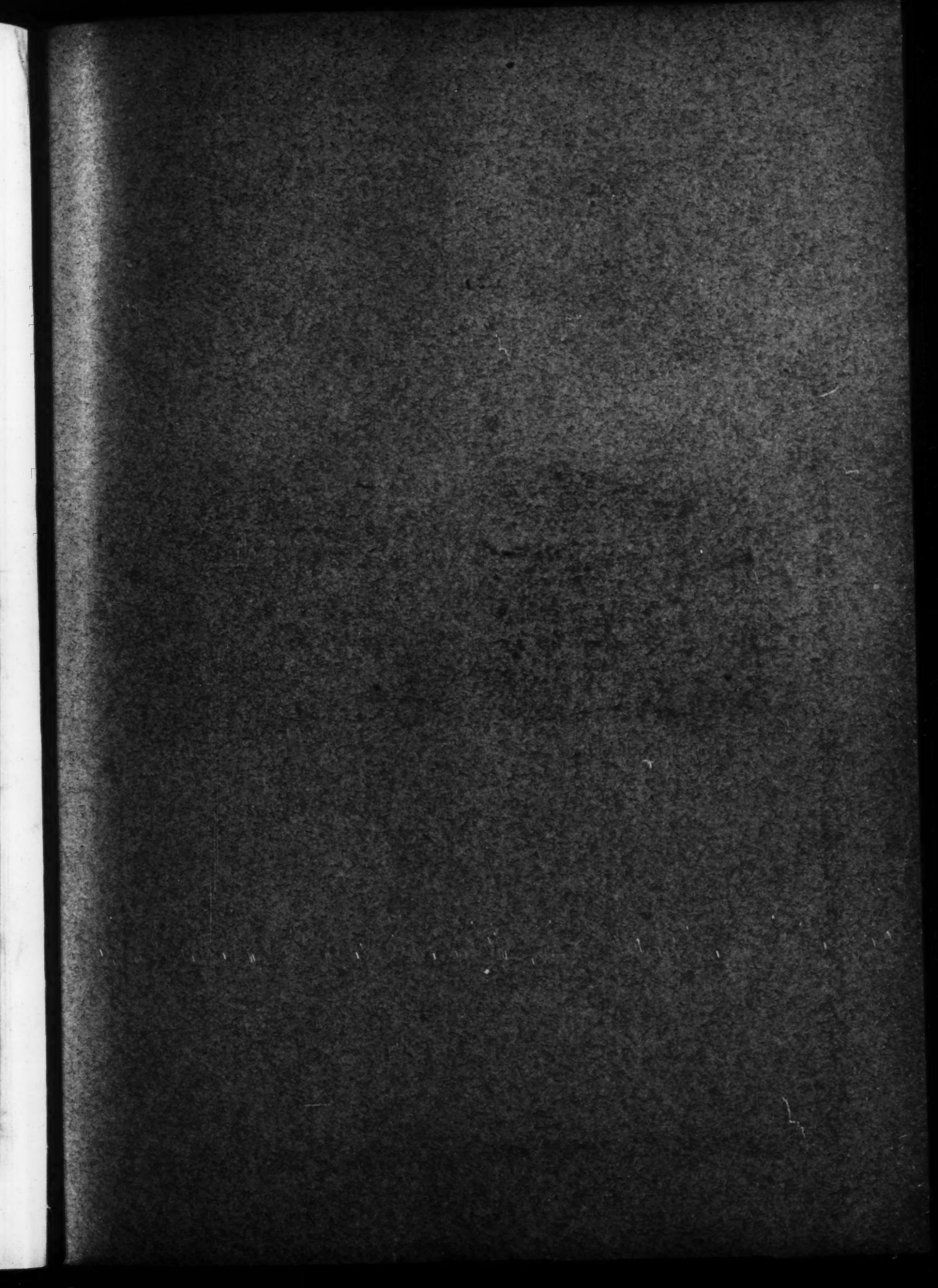
Especially recommended for use above the ground level on the interior of stone, brick or concrete walls to exclude dampness.

Has superior covering capacity and is vastly superior to other paints in its permanence and resistance to dampness. It penetrates into the pores of the brick so that an accidental abrasion does not break the waterproof seal. Furnishes satisfactory base for plaster and keeps the plaster from injury by dampness in the wall.

Velvex

Creosote Shingle Stains.

Send for the new free booklet, handsomely printed in colors, showing the beauty of these stains. Very economical and satisfactory.

BARRETT MANUFACTURING COMPANY

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